SCIENTIFIC AMERICAN

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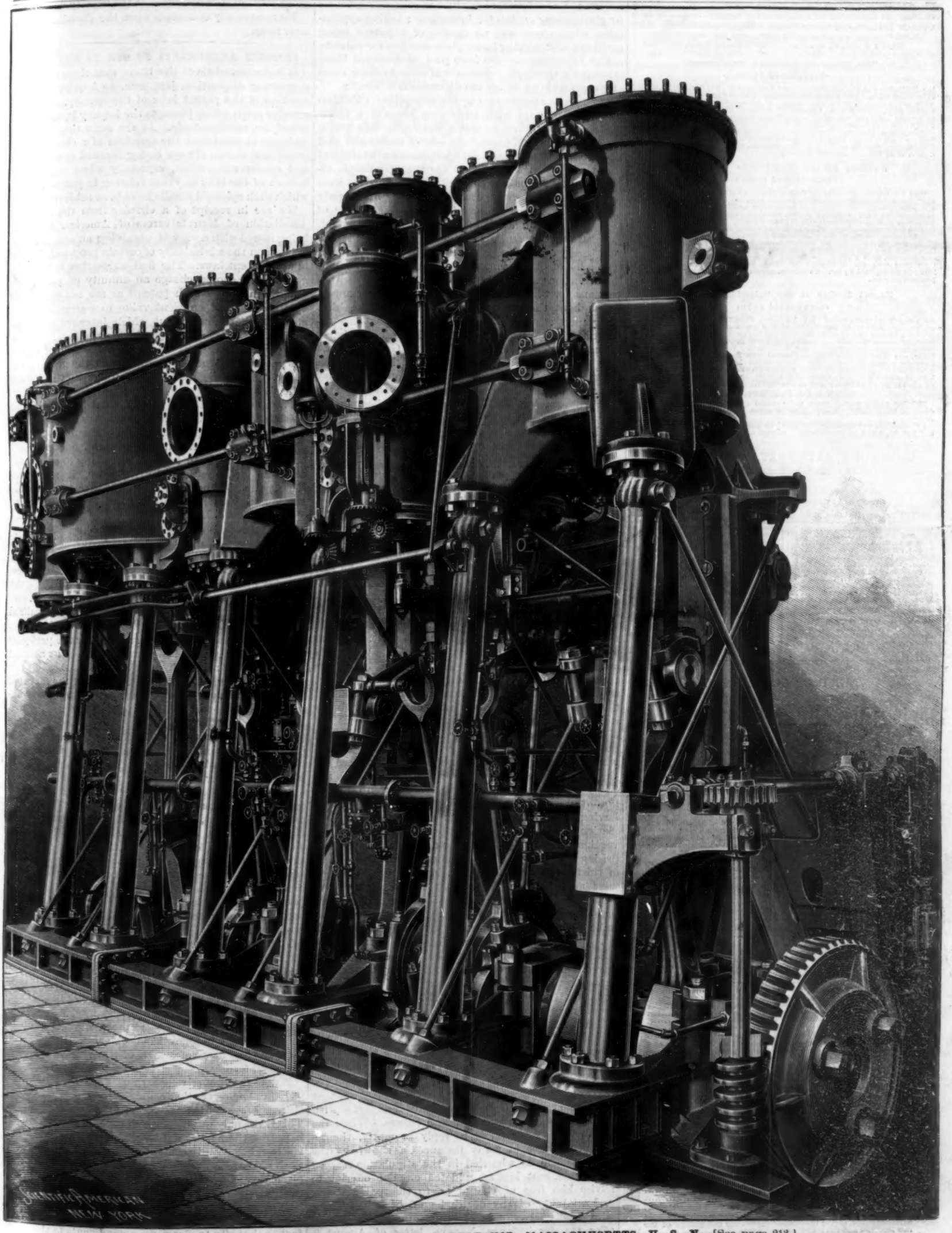
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXVII.—No. 14. ESTABLISHED 1845. NEW YORK, OCTOBER 2, 1897. [$3.00 A YEAR. WEEKLY.



ONE OF THE TWIN ENGINES OF THE BATTLESHIP MASSACHUSETTS, U. S. N.—[See page 213.]

Scientific American.

ESTABLISHED 1845

MUNN & CO., - - - EDITORS AND PROPRIETORS.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, - - NEW YORK.

TERMS FOR THE SCIENTIFIC AMERICAN.

(Established 1845.)

One copy, one year, for the U. S., Canada or Mexico.....$3.00
One copy, six months, for the U. S., Canada or Mexico..... 1.50
One copy, one year, to any foreign country, postage prepaid, £0 12s. 5d. 4.00
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner Franklin Street, New York.

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(Established 1876)

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for the U. S., Canada or Mexico. $6.00 a year, or £1 4s. 8d., to foreign countries belonging to the Postal Union. Single copies 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page.

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(Established 1878)

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NEW YORK, SATURDAY, OCTOBER 2, 1897.

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Price 10 cents. For sale by all newsdealers.

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A PATENT ATTORNEY FIRM TO BE DISBARRED.

As the result of his investigation into the charges against Wedderburn & Company, of Washington, D. C., the Commissioner of Patents has recommended that the firm be disbarred. The case has had a lengthy hearing before Assistant Commissioner Greeley, who has decided that Wedderburn & Company are guilty of irregular practices, and recommended them for disbarment. The decision has been approved by Commissioner Butterworth and is now before the Secretary of the Interior, Cornelius N. Bliss, for review and approval. Briefly summarized, the charges which have brought this firm under the ban of the Commissioner were as follows: Unprofessional conduct in soliciting business by giving away medals for inventions; taking applications when there was no chance of a patent being granted; and making incomplete searches for patents.

The following extracts from part of Assistant Commissioner's Greeley's decision will serve to show some of the grounds on which the disbarment is based:

"The various papers sent by the respondents (Wedderburn & Company) with their first letter to a correspondent—the "How to Get a Patent," "One Thousand Inventions Wanted," etc.—were calculated and intended to encourage would-be patentees to believe that there was a great demand for the most simple inventions; that in many fields of invention there were no satisfactory devices; that the public was eagerly awaiting inventions in lines in which, as a matter of fact, there are hundreds of devices already patented. The "One Thousand Inventions Wanted," as is evident to any one experienced in the arts, is little more than a list of old inventions. Certainly very many of the inventions therein stated to be "wanted" are inventions for which many patents have been granted. Throughout their advertisements and the pamphlets and papers sent out by them, these respondents endeavor to impress upon the public the value of simple inventions. They state in "How to Get a Patent" that small things are most valuable. In "Prizes on Patents" they state that "it is not the great, complex and expensive inventions that bring the best returns to their authors, but the little, simple and cheap ones." In the advertisement, "Wanted, an Idea," they ask "Who can think of some simple thing to patent?" In all this there is that half truth that is in its effect worse than a falsehood.

It is true that some small inventions, simple inventions, which have required little thought and little knowledge of the prior art on the part of the inventor, have proved of value. It is equally true, no doubt, that in lotteries some one for a trifling outlay has won a large prize. Yet the effect of lotteries is recognized as demoralizing to a degree. To endeavor to impress upon the public the idea that any one without experience in the art, without knowledge of what is claimed in the art, without study, and thought, and experiment, can evolve inventions of value, is as demoralizing as the idea so strenuously insisted on by lottery agents that any one who buys a ticket may win the great prize. It is as true in inventions as in everything else, that what costs nothing is worth nothing. The valuable inventions are those which are the result of hard work, careful study, and experiment, by those who have familiarized themselves with what others have done and with the real needs in the art. The careful student does not always produce inventions of value, but he is at least not likely to merely reinvent what is already known, what is already before the public, either adopted by the public or tested and thrown aside as worthless. The tyro, ignorant of what has already been done, ignorant of what is practical, what is needed in the art, having before him such meager and misleading information as that contained in the "One Thousand Inventions Wanted," works in the dark, and it is not surprising that he at most merely reinvents what is old. Out of thirty-three thousand inventions on which searches were made by the respondents in two years, over twenty thousand were, even by their searchers, incompetent and inexperienced as many of them were found to be, at most reinventions of what was already old. . . . From the exhibits in the case, it is apparent that a large proportion of those reached by the respondents' advertisements are country people, many of them, as shown by their letters, possessed of little education and small knowledge of the arts. To induce such people to believe that these old and well worked fields of invention are new and untried fields in which inventions of value could be readily made by them is grossly deceptive; is demoralizing to the same extent and in the same way as the alluring prospects held out by the lottery agent. . . . It has not always been the case that inventors sent on their inventions at once upon receipt of the respondents' first letter with its accompanying pamphlets and papers. When the supposed inventor failed to reply promptly, the respondents have in many instances, as shown by the evidence and as admitted in the stipulation signed by counsel, sent him an undated circular offering to advise him free of charge as to the patentability and salability of any device he might have. Those who took advantage of this apparently liberal offer (as, for instance, Nagaye, letter of August 3, 1896,) received in reply a letter containing information which, in so far as it was not positively false and misleading, was such advice as could very well have been given for nothing, for it was worth nothing. Instead of giving substantial advice as to patentability, it merely stated that the invention was of a patentable nature, but stated that to determine its patentability, a search at a cost of $5 would have to be made. The respondents, in sending out the letter promising advice free of charge as to patentability, were well aware that novelty is an essential, the primary essential, of patentability, and no advice as to patentability that would be of any value could be given without determination of the novelty."

We reserve any comments upon the decision until a later issue.

PROPOSED AMENDMENTS TO OUR PATENT LAWS.

It is characteristic of the times that there should be a growing disposition, just now, to inquire into the working of the patent laws of the country. The progressive spirit which prompts the inquiry is, on general principles, commendable. At the same time it should be borne in mind that the question of a change in existing laws should always be approached in a guarded and conservative spirit, especially when it affects a branch of our laws like that relating to patents, under which such splendid results have been achieved.

We are in receipt of a circular from the National Association of Manufacturers of America, which is being issued with a view of obtaining an expression of opinion on the advisability of certain proposed reforms in our patent laws. The first suggestion is that the government should charge an annuity on patents, in order to invalidate such patents as are not considered by the owners of sufficient value to warrant the payment of the annuity, but which interfere with the working of later and dependent patents. It is suggested that the annuity would clear the field of worthless patents and furnish an income to the government which "might be used to advantage in the Patent Office."

The chief objection to this proposal is that it is not possible for any one to foretell what is or is not going to become a valuable patent. It sometimes happens that a patent may lie dormant for years and may suddenly become invested with importance owing to some later discovery or invention. Furthermore, it may take some years of experimentation in order to get the invention in such a condition that it possesses commercial value. In the meantime, and while the inventor, who is generally impecunious, is harassed by adversity and the depression consequent upon his failure to perfect his invention, he is met with the necessity of raising funds to pay a harsh and unnecessary tax into an already overflowing treasury. To the poor inventor it would be an exceptional hardship.

As to the increased income which could be realized by the Patent Office, this institution already has more money than it can use; the surplus for the past year being over $300,000, and the total surplus to its account in the treasury amounting to over $5,000,000.

The second suggestion is that, in view of the fact that foreigners are allowed to procure patents in this country and hold the same without further expense or trouble than the first cost, while our citizens are obliged to pay annuities in many foreign countries, often amounting to hundreds of dollars, and also are in many cases obliged to work their devices at intervals, laws should be passed making annuities and working obligatory on all patents granted to foreigners in this country. In some countries it costs from $600 to $700 to secure and maintain a patent, as against $35 government fees in the United States. It is proposed that if a native of such a country applies for a patent in the United States, he shall be made to pay initial fees and subsequent annuities of the same amounts as he would have to pay at home. That is to say, the price for a United States patent shall be no longer $35 to all the world, but an amount varying according to the nationality of the applicant.

To this absurd proposal we feel it our duty to give our unqualified dissent. It is wrong in principle, and we fail to see that it can be productive of any good results should it be put into effect. Whether it is intended as such or not, it will carry the appearance of an act of retaliation against the foreign countries affected, and unless some good practical results can be shown as likely to follow from such a measure, we shall be open to a charge of a lack of international fairness and good feeling.

It does not properly concern us what the patent fees or requirements of other countries may be provided our citizens are afforded the same privileges as natives. This is the only question which concerns us and we believe that there is no nation which, in regard to these matters, has any discriminating laws against foreigners. Such a course as proposed would therefore be wrong in principle and foolish in policy, and would be distinctly retrogressive in spirit.

Additional importance is lent to this circular by a rumor from Washington that there is a movement on foot in that city to draw up amendments to the exist-

ing international treaties which will embody similar suggestions, and that these amendments will be presented at the forthcoming meeting of the representatives of the nations concerned, to be held at Brussels next December. One of these amendments would restrict the articles which are patentable in this country, so that no foreigner can patent an article in the United States which he cannot patent in his own country, and all the amendments appear to have more or less of the retaliatory flavor to which we have already referred.

It is to be hoped that the rumor is not well founded, or at least that the subject matter of the amendments is not as reported. There was a time when international discrimination existed in the matter of fees and taxes, but, fortunately, all such agreements were subsequently revoked, and the tendency of later negotiations has been in the direction of throwing open the several patent courts in the most liberal international spirit. It seems to us that the proposed amendments would be a decidedly retrograde step and one entirely at variance with the generous policy which has characterized our Patent Office in the past and has contributed so largely to its success.

We are in thorough accord with the third suggestion of the circular that we should have separate courts for adjudication of patents, with the object of expediting patent litigation.

If amendments are to be offered at the forthcoming conference, they cannot be too seriously considered, and no resolution should be placed on the table that has not received the most widespread and thorough discussion. We are glad to note in this connection that at the meeting of the American Bar Association, at Cleveland, the committee of fifteen was requested to consider such proposed amendments as are intended to be made at Brussels, and make recommendations to the Secretary of State, or head of other proper government department, as to the instructions to be given to the delegates from the United States to this conference.

THE SEVENTH INTERNATIONAL GEOLOGICAL CONGRESS.

BY HORACE C. HOVEY.

About a thousand geologists were in session recently for eight days at St. Petersburg, Russia. They adjourned on September 5. The printed official list, in which some changes were afterward made by reason of additions and absentees, may be taken as fairly representing the make-up of the congress. Russia, of course, *furnished* the largest number of members, 271 in all. Germany stood next with 187 delegates. Then came the United States of America with 118 names. From France came 89; from Great Britain, 72; from Italy, 51; from Austria, 76; from Switzerland, 23; from Belgium, 24; from Sweden and Norway, 14; and the remainder from Spain, Holland, Servia, Denmark, Portugal, Roumania, Australia, India, Japan, Transvaal, New Zealand, Canada, Mexico and the Argentine Republic—twenty-four nations in all, and probably more when the final list appears. Amid so many languages some one had to be selected as the official medium of communication and record, and that distinction was unanimously accorded to the French tongue. Yet as not a few who are eminent in science are not equally so as linguists, much liberty was allowed in the discussion, and a few papers were read in English or German. Unfortunately for most of us, the daily reports by the press were in Russian, a language whose intricacies we have not mastered beyond the requirements of the hotel, the railroad and the street. The immense treasures of knowledge, especially in the various sciences, that are now locked up in the Russian language ought, by translation or otherwise, to be made accessible to the remainder of the civilized world. As we explored the mazes of the great museums of St. Petersburg, Moscow, Kazan, Ekaterineburg and other Russian cities, and found most of the specimens labeled and described in Russian, we felt regret that, besides the vernacular, they could not also have given us in French or in Latin the knowledge that we so much desired and generally found it hard to obtain. It should be added, however, that the committee of arrangements generously distributed for our benefit guide books (in French) and other helpful literature, as well as numerous maps and other aids, besides the verbal information so freely and patiently given in answer to our myriad questions on every imaginable topic. Especial mention should be made of the voluminous guide book prepared expressly for the excursions before and after the session of the congress, a thick octavo in thirty-four parts, self-bound, so that any one part or more could be extracted for use and easily returned to its place again. We found many citizens in the large places who could speak French or German, and here and there one familiar with English. But in exploring more rural regions, like those along the Volga and amid the Ural Mountains, we found the mass of the people speaking no other than their native tongue, and wondering in their simplicity why we could not speak it as well as they, or at least well enough to answer their civil and perfectly natural inquiries as to our welfare and our wants. Much of our intercourse with the natives had to be by pantomime, and it is wonderful how many ideas can be exchanged by that primitive means of communication.

The president of the Geological Congress, His Imperial Highness the Grand Duke Constantine, who is also the president of the Imperial Academy of Sciences, opened the sessions by a graceful address of welcome, speaking of the attractions and resources of the great country whose honored guests we were, but also recognizing fully the international character of our organization. The display of gold and scarlet and the brilliant uniforms of military officers present at the opening dazzled our republican eyes. The best we could do was to wear our dress suits and make the most of the silver medal with red, white and blue ribbons attached to it, the simple insignia of the Geological Congress; its heraldry a hammer and mallet crossed in a wreath of oak leaves, and its motto the Latin words, "Mente et Malleo;" and on its obverse another wreath, encircling the legend, "Rossia, 1897." The acting president was Dr. A. D. Karpinsky, the director of the geological survey; and the general secretary, Dr. Th. N. Tschernyschew, geologist in chief. Dr. James Hall, of Albany, N. Y., was named as the first of the three honorary presidents, the other two being Prof. Capellini, of Bologna, and Prof. Renevier, of Lausanne. Vice presidents from the various nationalities represented were also appointed, forty in all, some one of whom usually presided at the daily sittings of the Congress. Those from the United States were Profs. Marsh, Emerson, Frazer and Emmons. Seven assistant secretaries were appointed, who found the office no sinecure. Mention must also be made of the diligence of the young men from the university, who served on the bureau of information, and whose patience we taxed in many ways, necessary and sometimes unnecessary.

Early in the meetings of the council Prof. Gaudry, of France, extended an invitation from that nation for the eighth meeting of the International Congress, to be held in Paris in A. D. 1900.

The invitation for the ninth meeting, in A. D. 1903, was brought by M. Tietze, on behalf of the Austrian geologists, to be held in Vienna.

Both these invitations were unanimously accepted with applause. While undoubtedly the great majority of those gaining membership in this International Congress are worthy of the distinction, it has been objected to that a few are enrolled who have either been noted in chemistry, engineering, or some other science not included under the general term "geological," and now and then some one not known in any branch of science. To meet this difficulty the American geologists offered, through Prof. Emmons, a resolution that, hereafter, membership shall be reserved for those who are approved by the principal geological societies or institutions of the countries to which they belong. Other ways of meeting the matter were also suggested.

The daily meetings were held in the large hall of the Zoological Museum of the Academy of Sciences, which was beautifully decorated for the occasion.

One of the important questions discussed was as to the best methods of the classification of geological strata. Every student of geology has found himself more or less confused as to the terms in which the formations of different parts of the globe are described. There is an imperative need of revising the nomenclature and much has recently been written on the subject. Among those who took part in this discussion were Profs. Renevier, Loewinson, Lessing, Frech, Zittel, Bertrand, Karpinsky and Pavlow. The conclusion was in the form of a resolution advising geologists to rest on the ground of the historic method of classification, with the endeavor to make it gradually "more and more natural." To this it was added that the council should name a special commission whose duty it should be 'to study the principles of classification, in the spirit of this resolution." This same subject was more fully discussed in the general session, where highly important suggestions were offered, especially by some of the Russian geologists, growing out of their observations of the mineralogical composition and structure of the rocks found amid the Ural Mountains. Lengthy and valuable memoirs were presented to the Congress concerning various aspects of geological nomenclature, to which more full recognition may be given in some future communication. The conclusion reached seems to be perhaps the best that can be done at present, but there is a strong and growing demand for something better than the so-called "historical method," which, as was well remarked by Dr. Karpinsky, is wholly artificial. What is needed is a system natural, practical and uniform.

The business meetings occupied the morning; but the afternoon of each day was given up to the reading of scientific papers and their discussion. The following are the titles of some of the most important: "On the Glacial Period in North America," by Prof. Upham, of Minnesota, and "On the Direction of the Flow of Glaciers and the Origin of Moraines," by Prof. H. F. Reid, of Johns Hopkins University. These were followed by two papers by Mr. Lindonall, on "The Cause of the Ice Age," and "How is the Mammoth Frozen in North Siberia?" Mr. Marsden Monson, of California, offered a paper on "The Evolution of Climates." Papers on "Orography" (or mountain making) were read by Messrs. Meunier, Sacco, and Prinz. Prof. Meunier also gave the result of his studies concerning the platinum region of the Ural Mountains. Dr. Tillo gave his views as to the remarkable depression of the center of the Asiatic continent, and also on certain magnetic anomalies of the center of Russia in Europe. Dr. Makowsky spoke on the existence of the great mammalia, the mammoth and rhinoceros, the huge bones of which are found in such comparative abundance in Russia, using the superb materials collected to explain his paper. A communication on the fossil reptiles of Perm and Wologda was offered by Mr. Seeley. Other papers and addresses were presented, all of which, either in full or by abstract, will be published in the proceedings of the society. The writer is aware that this is an imperfect resumé of the proceedings and deliberations that absorbed the attention of some of the most noted geologists of the world, and it is his intention hereafter to review some of them more in detail. He will also give some account of the remarkable geological excursions made in connection with the Congress, occupying many weeks and covering many thousands of miles. They were planned with great care and managed with ability. They gave those who availed themselves of the privilege an opportunity to see practically the whole of Russia in Europe and a small portion of Russia in Asia, and to get some idea of the immense territory and vast resources of the empire of the Czar. Everywhere the citizens came out en masse to welcome us, and frequently with music and banners and sumptuous banquets. The respect with which they treated their national guests was uniform, whether shown by prince or peasant. The cities of St. Petersburg and Moscow led the van in their costly and regal hospitality, but did not really exceed what was done by some of the smaller cities less widely known. The doors of the Summer Palace at Peterhof were thrown wide open for our reception, and the banquet spread in our honor in these imperial halls, amid marvelous fountains and rare paintings and inspiring music, was a feast never to be forgotten. The mayor of St. Petersburg also received us in the City Hall; the Grand Duke gave a reception to a select number at the Marble Palace, and there were numerous more private manifestations of Russian hospitality.

The public buildings, the Winter Palace, the Ermitage, with its marvelous treasures of art, the Bergacademie, with its renowned collections of specimens in paleontology and mineralogy, and, indeed, every place of beauty and learning and historical interest, parted its doors for us at the sight of our simple silver badge. This also was a talisman permitting the use of the camera without interference or hindrance. As a result hundreds of photographs of rare, curious and interesting objects were taken, and it is safe to say that in no city, from St. Petersburg to Ekaterineburg, could any stray kodaker easily find a roll of films or box of plates remaining, unless the exhausted supply has been replenished during our stay. The market is swept clean. Pictorial fruits will be abundant as soon as they have had time to ripen.

Perhaps the reader may be interested to know how long it takes to go from New York to Moscow when one is in a hurry. A cablegram from Dr. Karpinsky decided me to join the excursion to the Ural Mountains that was made before the Congress met at St. Petersburg. I sailed by the next steamer, which happened to be the Campania, of the Cunard line; reached Liverpool in six days and London by midnight; took a morning train by the Flushing route, and arrived at Berlin on the morning of the eighth day, where I rested for twelve hours; crossed the Russian frontier at Alexandrowo with the usual delay for inspection of baggage and passport; and by noon of the tenth day the gilded domes of Moscow flashed into view. By the official tables the entire distance from New York to Moscow, by the route taken, extends 5,000 miles; thus making the average rate of daily travel 500 miles for the ten days, including stops for about twenty-four hours en route. Our flying glimpse of England in harvest time; of Holland's luxurious gardens and picturesque cottages and mansions; of Berlin's ripe yet modernized magnificence, prepared us by way of contrast for what we were to see in the proud and strong Russian empire, where the Occident and Orient so strangely and wonderfully commingle.

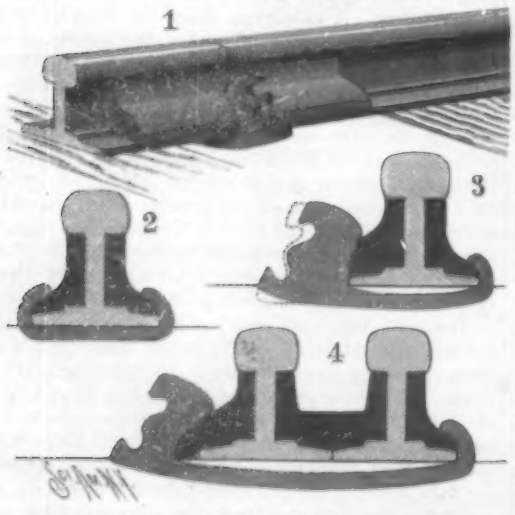
As France taxes bicycles and tricycles, the number of machines used in the country is known exactly. On January 1, 1897, there were 329,814 taxed, an increase of nearly 74,000 over 1895, which had shown an increase of 53,000 over the preceding year. The revenue obtained in 1896 was 3,272,389 francs. Paris department, the Seine, heads the list with 62,892 bicycles, paying a tax of 626,916 francs.

High Kite Flying.

The highest recorded altitude ever reached by a kite was obtained on the afternoon of September 20, at the Blue Hill Observatory. The top kite reached the height of 10,016 feet above sea level, or 8,386 feet above the summit of the hill. The ascent began at noon, and the highest point was reached at seventeen minutes past four, when seven Hargrave kites were held by nearly four miles of wire. An instrument for recording the temperature, humidity and pressure was hung about 130 feet below the highest kite. At the highest point reached the temperature was 38 degrees, while at the ground it was 63 degrees. At the height of 4,000 feet the humidity rose rapidly; at 7,000 feet the humidity was almost at the point of saturation; at 8,000 feet it began to fall, and at the highest point it was extremely low. At the ground level the humidity remained low during the entire ascent. The instruments and kites were brought down at 6:40 P. M., having been more than a mile above the hills for over five hours.

IMPROVED RAILS AND RAIL FASTENINGS.

The accompanying engraving illustrates some improvements in railway rails, fish plates, and means for holding them to the rails, which form the subject of a patent issued to James Johnston, of No. 13 Public Square, Bradford, Pa. The use of these rails involves certain changes from the ordinary method of track making, the rails being anchored to the roadbed by their middles. They are held in line by track spikes, and the fish plates are designed to prevent up and down play at the ends of the rails, having no other function. The rail and fish plates are shaped to correspond with one another for this purpose, and the rail is further altered on the margin of its flange for the purpose of making a solid guard rail combination. The inventor claims that with this construction the track will not creep, and the rails will not be subject to the usual principal causes of breakage, as there will be an absence of pounding and clicking at joints, and greater safety in guard rails—all to be had without increased expense, as what is spent on anchors and milled rails will be made up in saving of fish plates, nuts, bolts and labor. Fig. 1 represents the rails tied together by the fish plates and clamps, Figs. 2 and 3 being sectional views, and Fig. 4 representing a section through the guard rails, showing the spacing block and fish plates employed. The fixing of the anchors in the roadbed must be done with absolute accuracy. If thirty foot rails are to be used, and it is expected that they will expand one-fourth of an inch under highest temperature met with, then the anchors will be placed at thirty foot, one-fourth inch centers apart. In ordinary situations a good tie will be a sufficient foundation for an anchor, but on grades, side hills, or other difficult situations, other security, such as piles, drive pipe, crib work, or masonry, must be provided. The rails will be made with an indentation in the flange, in the exact center, so that after the anchors are once correctly placed, it will be only common labor to put in the rail and secure it with a soft iron key hammered down flush. Being thus laid, the ends of the rails will always move to and from the centers in contraction and expansion. All joints will be equally open, and rails cannot crowd



JOHNSTON'S RAILWAY RAILS AND RAIL FASTENINGS.

one another; in fact, they should never quite touch. In the design of the rail on section the ordinary pattern is followed, but it is made heavier by the addition of ribs to make the web square with the head and flange, and the outer margin of the flange is raised and made heavier in order that rails placed side by side for guards may have a bearing against one another. The rail is preferably finished in a milling machine, in order to obtain true angles and surfaces, and the band or clamp with which the fish plates are held in place will cost little compared with the cost of bolts, nuts, and nut locks ordinarily used. These combinations are all secured in place by bands, which are passed under the rail and turned up on both sides, and should any of these details fail, or appear to be insufficient at any time, the ordinary methods now employed may still be used.

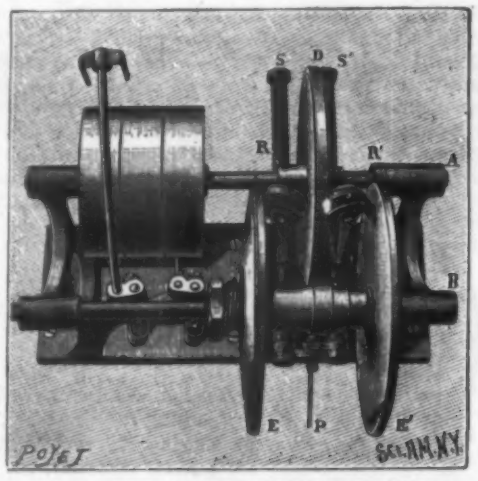


Fig. 2.—THE OSGOOD FRICTION CLUTCH.

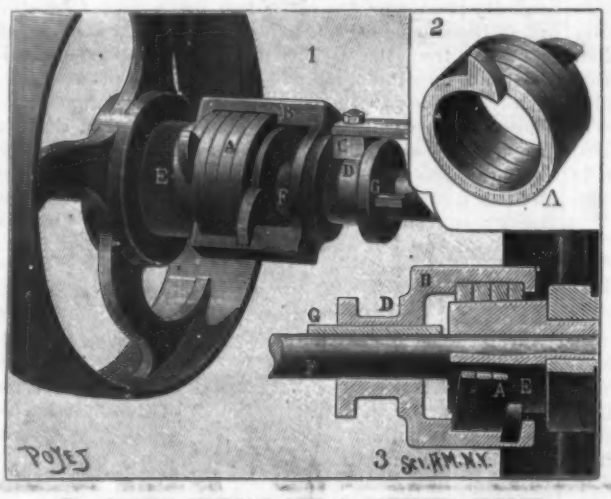


Fig. 1.—THE LINDSAY SPIRAL COUPLING CLUTCH.

MECHANICAL POWER TRANSMISSIONS.

We have recently had an opportunity of studying two new systems of transmission, about which we shall say a few words.

The first of these (represented in Fig. 1) is a Lindsay coupling clutch. The pulley that it is desired to set in motion is keyed upon a cone, E, which is solid, provided with bearings and loose upon the shaft, F. Upon this cone there slides another and elastic one, A (No. 2), consisting of a steel spiral which is provided with lugs at its extremity. The number of spirals and the section vary according to the power to be transmitted. The arms of a balanced piece, B, abut against the lugs, and the piece is provided with two tappets that are in contact with the spiral, and also with a groove, D, in which moves a slide, C, that may be maneuvered from a distance by means of a lever. The piece, B, is fixed to the shaft, F, by means of a key, G. In order to throw things into gear, it suffices to push forward the block, C, when the piece, B, will also be moved forward and carry along the spiral, A, which will slide freely and bear against the cone, E, and set it in motion. It will be seen that it is possible to easily graduate the setting in motion through a maneuvering of the lever; and that it is also possible to cause the elastic cone to move forward upon the solid one as slowly as may be desired. It is possible, too, to limit the power transmitted by not shoving the elastic cone home. It is, in fact, only when the latter is perfectly in gear that the full power for which it is calculated is transmitted. The throwing out of gear is done very easily by a contrary maneuver. Let us add that the two cones should always be lubricated. In order to protect it from dust, and for various other reasons, the elastic cone is inclosed in a tight cast iron box. The transmission may be reversed according to circumstances. Upon one extremity of the driving shaft is keyed the cast iron cone, and upon this is placed the elastic one. In this case the solid cone revolves freely in the interior of the other when the driving shaft is in motion. These couplings are constructed in two sizes, one of which permits of operating at all angular velocities up to 2,000 revolutions a minute, while the other is adapted for heavy motions and revolutions of feeble angular velocity. These apparatus have the advantage of throwing into gear progressively, without any shock and at all angular velocities. The throwing out of gear is just as easy, and is instantaneous and complete.

Let us point out another possible utilization. As the elastic cone is provided with lugs, the motion may be transmitted in opposite directions to the shafting to be driven, when the driving shaft is actuated in one direction or the other. Supposing that we have two motors actuating one shaft in common through pulleys provided with couplings having a double motion, it will be possible to render regular the running of these two motors one by the other. The coupling may also be so arranged as to prevent one motor from carrying along the other.

Sometimes it is necessary to have transmissions of variable velocity. Fig. 2 shows us the principal arrangements of the Osgood system. A shaft, A, which receives motion from the pulleys to the left, carries a disk, D, to the left and right of which are placed two friction rollers, R and R', that present bevel faces at their rims. These rollers may be easily shifted by tightening the springs, S and S', more or less by means of the rod, P. At the sides of the rollers are arranged two other disks, E and E', that actuate the same shaft, B, that transmits the motion. The rollers, R and R', rub through one of their faces against the disk, D, and through the other face against each of the disks, E and E'. These latter are therefore set in motion, but with a much greater angular velocity, and one that varies according to the position occupied by the rollers. The velocity is maximum when the rollers are in the center and minimum when they are at the periphery.—La Nature.

A Lesson in Economy.

Consul Germain writes from Zurich, in regard to a plan recently introduced in the public schools of several European cities. In Brussels, the children attending public schools were requested by their teachers to gather up, on their way to and from the school, all such apparently valueless objects as old metallic bottle capsules, tin foil, tin cans, paint tubes, refuse metals, etc., and deliver their collections daily to their respective teachers.

In the period from January 1 to October 1, 1895, or within eight months, the following amounts were collected: Tin foil, 875 kilogrammes (1,925 pounds); old paint tubes, 100 kilogrammes (220 pounds); bottle capsules, 2,007 kilogrammes (4,415 pounds); scraps of metal, 555 kilogrammes (1,221 pounds); total, 3,537 kilogrammes (7,781 pounds). This apparent rubbish was disposed of and the proceeds applied so as to completely clothe 500 poor children and send 90 sick ones to recuperation colonies, and there still remained quite a balance, which was distributed among the poor sick of the city.

A VEHICLE AXLE IMPROVEMENT.

The construction shown herewith, which forms the subject of a patent recently issued to Simon J. Harry, of Washington, D. C., affords novel means for preventing the cap nut from turning. Fig. 1 illustrates the application of the improvement, portions of the hub being broken away. The axle, spindle and box may be of ordinary pattern, but the outer end of the spindle is threaded, as shown in Fig. 4, and has a seat for a collar with central opening squared on two sides, as shown in Fig. 2, where the collar is represented in place, having on its outer face a spring pawl. The pawl, shown in Fig.

HARRY'S HUB ATTACHING DEVICE.

3, fits in a suitable recess in the face of the collar, and its point projects to engage a shoulder forming the end wall of a recess in the inner end of the cap nut, locking the latter from accidentally turning off by jarring or the backing of the vehicle. To release the pawl, a slender rod, nail or other suitable implement may be passed through an opening in the nut, by which the point of the pawl may be pressed back and the nut released.

THE ENGINES OF THE BATTLESHIP MASSACHUSETTS.

The Massachusetts is one of three heavily armed and armored first class battleships whose construction was authorized by Congress June 30, 1890. They were to be specially designed for coast defense, but at the same time were to possess sufficient seaworthiness to enable them to engage in offensive operations in distant seas. The construction of this trio was put in hand at once, two, the Indiana and Massachusetts, being built by the William Cramp & Sons' Ship and Engine Building Company, of Philadelphia; the contract for the third, the Oregon, being obtained by the Union Iron Works, of San Francisco.

The handsome full page engraving which forms the frontispiece of this issue was made from a photograph of one of the twin main engines of the Massachusetts, as they stood completed in the erecting shop at the Cramp shipyard. There are two vertical, direct acting, triple expansion engines placed in separate watertight compartments, the engines being built exactly in duplicate. The cylinders are carried by inverted cast steel A frames on one side and by hollow forged steel cylindrical columns on the other, which are bolted to a cast steel bed plate and strongly sway-braced. The high pressure cylinders are fitted with working liners and the intermediate and low pressure cylinders are steam jacketed on the sides and bottom. The diameter of the high pressure cylinder is 34½ inches, of the intermediate 48 inches, and of the low pressure cylinder 75 inches, the common stroke being 42 inches. The cylinder relief valves are placed on the valve chest castings, on connections between the steam and exhaust sides of the main valves. Single ported main valves, provided with balance pistons, are used, and of these there are one for the high pressure, two for the intermediate and four for the low pressure cylinder. Stephenson valve gear with double bar links is used.

The pistons are dished steel castings, and the piston rods, 7 inches in diameter, are of forged steel, as are also the connecting rods, which are 6⅝ inches diameter at the upper end and 8½ inches diameter at the lower end. The crossheads are of forged steel and they are provided with manganese bronze slippers faced with white metal. The eccentrics are of cast iron, the straps of composition and the rods of forged steel. The steam reversing engine, with 14 inch by 20 inch cylinder, is connected to an arm on the reversing shaft, and the hand reversing gear, consisting of wheel, wormshaft, pinion and rack, is also connected to an arm on the reversing shaft. At the forward end of the main engine will be noticed the engine for turning over the main shaft. It is attached to the frame of the high pressure cylinder and has a pair of cylinders 7 inches diameter by 7 inches stroke. It turns a worm on its main shaft, which in turn operates a vertical worm shaft gearing to a large worm wheel on the main shaft, as shown.

The main steam pipe, 13 inches diameter, is of copper, reinforced by steel bands placed 6 inches apart. The exhaust pipe to the intermediate cylinder is 16⅛ inches in diameter, that leading to the low pressure is 20⅛ inches, and the two leading to the condenser are 18⅛ inches in diameter. There are two main condensers in which the circulating water passes through the tubes, the total cooling surface being 12,710 square feet, and in each engine room there is a Wheeler condenser connected with the auxiliary exhaust pipes. Each main engine is supplied with a Blake double, vertical, single acting air pump, in which the steam cylinders are placed directly over the pump cylinders, the pump and piston rods being in one length. For each condenser there is a double inlet centrifugal circulating pump which draws from the sea, bilge and main drain pipe and may discharge into the condenser or overboard. These pumps have each a capacity of 9,000 gallons per minute. They are driven by single cylinder, horizontal engines with cylinders of 6 in. stroke and 12 in. diameter. For fuller details of the piping, valves and condenser the reader is referred to a paper by C. H. Hayes, of the United States navy, on the contract trial of the Massachusetts, published in the Journal of the American Society of Naval Engineers.

The shafting is hollow and of forged steel. The line shafting is in two sections and is supported on three bearings. The propeller shafts are fitted with a composition casing from just inboard the stern tube shafting box to the propellers. The thrust bearings are of cast iron and are of the horseshoe pattern. The pedestal carries a composition bearing lined with white metal, the cap of the bearing being of cast iron lined with white metal. There are 11 horseshoes, 21 inches diameter, made of a mixture of cast iron and steel, and lined with white metal. The crank shafts are 14 inches diameter, with a 6 inch hole; journals are 14 inches diameter by 17⅜ inches long. Crank pins are 15 inches by 17 inches, with a 6½ inch hole. Thrust shafts are 13¾ inches diameter, with 6 inch hole, and the line shafts are of the same dimensions.

The propellers are of manganese bronze and are three bladed. The pitch is variable, from 14 feet 3 inches to 16 feet 3 inches. The bosses are secured to the shaft by a feather key and a steel nut which is screwed on and locked in place.

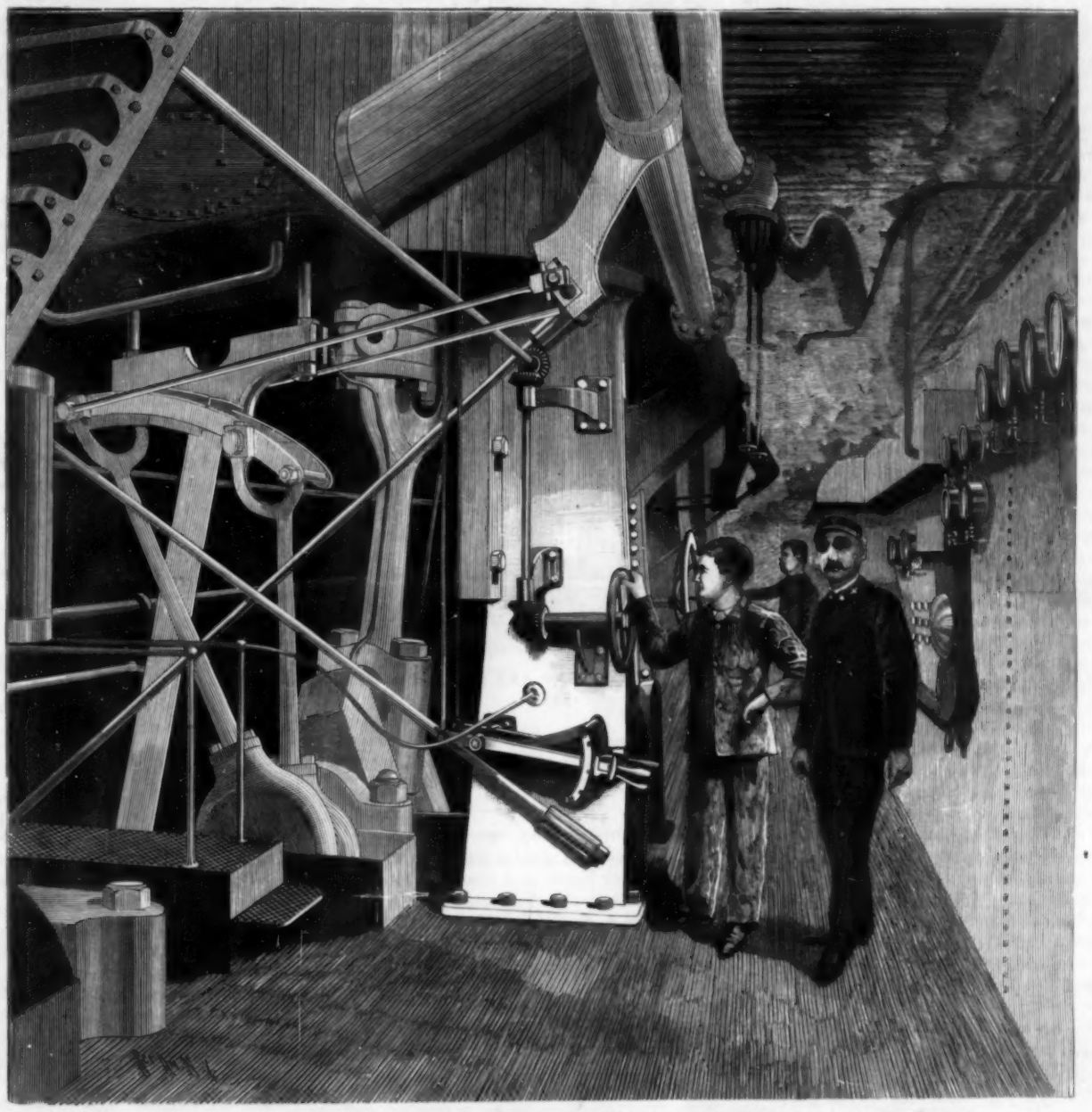
There are six steel boilers, four double-ended main and two single-ended auxiliary, all of the horizontal fire tube type. The former have eight and the latter two corrugated furnaces. The longitudinal joints are treble riveted, with double butt straps. The joints on the circumference are lapped and treble riveted. The furnaces are fitted with Cone's patent shaking grate bars. The steam pressure is 160 pounds. The shell plating of the main boilers is 1 11/16 inches thick; the diameter is 15 feet and the length 18 feet. The tubes are 2¼ inches outside diameter and their total heating surface is 3,647·5 square feet, the total heating surface of each boiler being 4,310 feet. The closed stokehold system of forced draught is employed, and air is supplied by ten Sturtevant blowers.

There are two vertical duplex double acting Blake pumps in each feeding fire room of the main boilers and in each fire room of the auxiliary boilers. The main feed pumps draw from the feed tanks, delivering only to the boilers, and the auxiliary feed pumps draw from the feed tanks, sea, bilge, secondary drain pipe and boiler and deliver to the boilers, fire main and overboard. Altogether there are thirty-four pumps of various kinds on the ship.

The work that has to be done by the boilers is understood when it is borne in mind that, in addition to supplying the main engines of over 10,000 horse power, they must supply steam for 86 auxiliary engines, or a total of 158 cylinders.

The official trial consisted of two runs in opposite directions, over a measured distance of 31 miles, with a smooth sea and generally favorable conditions. The draught of the Massachusetts was 23·79 feet forward and 24·38 feet aft, and her displacement 10,265 tons. The average speed was 16·21 knots. The revolutions per minute were for the starboard engine 132·3 and for the port engine 133·06. The boiler pressure was 163 pounds and the pressure at the engines 155·6 pounds. The total indicated horse power was 10,402·6, and a maximum horse power of 11,440 was indicated during 15 minutes of the run to the south.

The boilers gave great satisfaction and there was no tendency to prime. The main engine ran without any heating of consequence, and it was necessary to use but little water. A careful examination was made of boilers and engines after the trial and all parts were found to be in excellent condition.



ENGINE STARTING GEAR AND ENGINE ROOM BATTLESHIP MASSACHUSETTS.

The engraving on this page represents the interior of one of the two engine rooms of the Massachusetts, showing on the right the longitudinal bulkhead. In the center is seen the starting gear, and we have a glimpse of one of the heavy connecting rods and the link motion.

We are informed by Mr. George W. Melville, engineer-in-chief of the navy, that circumstances prevented the carrying out of a trial for coal consumption of sufficient length to give reliable data.

To Blacken Wood.

M. Koninck suggests the following method of blackening wood, which has the advantage of resisting acids and alkalies:

A.

Cupric chloride	75 parts.
Sodium chlorate	67 "
Water	1000 "

B.

Aniline hydrochlorate	150 parts.
Water	1000 "

Paint the wood with A and a short time after with B, and remove with a damp cloth the yellow powder that forms. Repeat this operation every day till the desired color is obtained, and then rub the wood with vaselin or linseed oil. By using potassium bichromate instead of the soda salt, a good black color is obtained at once.—The British Journal of Photography.

Over 616 Miles in 24 Hours.

M. Cordang, the Dutch long distance rider, has covered himself with glory. On the evening of September 15, at the Crystal Palace, London, he started against the 24 hour record. As the result will show, his pace was terrific from the start to the finish. In 19 hours 17 minutes and 28 1-5 seconds he lowered the world's record and had covered 500 miles. He bent to his work in the last four hours, and without slackening his speed raced for a record that will stand for a long time, even in this record breaking age. As he neared the end he gathered himself together and raced like the wind, says the American Wheelman. He finished his race in a grand burst of speed, and at the end of his ride appeared but little the worse for his great race. He covered 616 miles and 340 yards.

Cordang was entered in the recent twenty-four hour race at Paris, but had an accident in the early part, and was compelled to withdraw. He was greatly chagrined at this, as he had confidently expected to beat Huret, who in that race covered over 564 miles in the twenty-four hours. He has been training assiduously ever since, and the record made was an evidence of the good cause he had for confidence in himself. Cordang has not shown any very remarkable speed heretofore this year, but has always been rated as one of the best long distance riders. In 1895 he won the 100 kilometer championship, and he also holds several of the Dutch records.

Return of the Peary Party.

Although Lieut. Peary's latest Arctic venture has not been marked with any sensational discoveries, still it has been crowned with great success. There was no attempt made to reach a very high latitude, the idea of the expedition being to establish a principal base of supplies from which the explorers could start next season, when Lieut. Peary with one or two companions will make a dash for the pole. The "Hope" came into Sydney, C. B., on September 20, burning her last ton of coal and with her bulwarks smashed. The vessel was nearly as deep in the water as when she left the port, for the great Cape York meteorite, the largest in the world, was in the hold bedded in tons of ballast. Lieut. Peary found that the Esquimaux of the Smith Sound region were eager to co-operate with him in the work of exploration to the north of Greenland, which will be attempted next year. The party visited Cape Sabine and procured relics of the ill-fated Greely expedition, most of whose members perished of starvation at that point. The various parties which had been left at different points on the way north were taken on as the steamer came southward. The summer in Baffin Bay was marked by almost continuously stormy weather and an unusual scarcity of ice. The Hope will remain at Sydney only long enough to coal and will then proceed to New York to land the meteorite.

The meteorite is of great interest, although there has been some talk that it was not really a meteorite. It will make a valuable addition to the Natural History Museum and will be worth all the expense and labor of the voyage. Forty-five years ago, when Inglefield returned to England after his explorations along the northwest coast of Greenland, he reported that the natives in the neighborhood of Cape York tipped some of their weapons with a metal which was obtained from some big stones on the coast. Inglefield did not find these stones, which were only discovered by Peary on his second visit to northwest Greenland. As was suspected, the rocks he discovered proved to be meteorites of uncommon size, and one of them proved to be by far the largest meteorite known.

The Enchanted Mesa of New Mexico.

A survey has recently been made of the "enchanted mesa" of New Mexico by a party sent out by the Bureau of American Ethnology. For a long time there has been a tradition that the "mesa" was inhabited, but that it was abandoned in consequence of the destruction of the pathway leading up one of its precipitous sides, the catastrophe being doubtless due to a cloudburst. The traditional catastrophe was magnified by repetitions, so that the Indians came to regard the elevated plateau as inaccessible.

Some years ago, Mr. F. W. Hodge, of the Bureau of Ethnology, determined to make the ascent, but he was deterred on account of the sentiment of the Indians, who held the mesa sacred. During the past summer, Prof. William Libbey, of Princeton University, ascended the mesa without finding any evidences of occupancy. Reports of this expedition having reached the neighboring Indians, they finally consented to have the party sent out by the Bureau of American Ethnology ascend the height. After measuring the eminence by triangulation, the party ascended along the ancient route and encamped on the summit for the night. Mr. Hodge examined the ground critically and Major Pradt, United States Deputy Surveyor, made a survey of the summit. A. C. Vroman, of Pasadena, Cal., obtained a number of photographs. Several potsherds, two broken stone axes, a fragment of a shell bracelet, and a stone arrow point were the chief evidences of former occupancy found on the crest, but potsherds, etc. were found in the talus swept down from the summit. The Indian tradition is therefore affirmed. No great difficulty was found in ascending the summit, save for a few feet at the top of the cleft. This chasm was spanned by means of an extension ladder.

Prof. Libbey, who made the ascent in July, reached the summit by throwing a cable over the mound by means of a cannon. The cable once having been secured, the ascent was made by means of tackling arranged for the purpose.

IMPROVED SASH HOLDING AND REMOVING DEVICES.

A novel form of sectional and removable window bead, which holds a sash to slide vertically, and which may be removed to permit the removal of the sash, is shown in the accompanying illustration, and has been patented by Richard Bohrisch, of East Las Vegas, New Mexico. The outer bead is a permanent one and the two inner beads are made in sections, the upper sections permanent and their lower ends beveled and transversely apertured, a plate adapted to receive a threaded pin being secured in the window frame under the lower end of each section. The removable section of the inner bead, A, has its upper end beveled to correspond with the bevel at the lower end of the upper section, to which it is removably secured by a thumb nut and threaded pin at the top and a bolt entering a T shaped slot at the bottom. The removable section of the intermediate or parting bead is similarly secured in position at the top, its lower end being inserted in an opening in the base of the window frame. In a recess in the guideway of each sash is a hook, adapted to engage an eye on the end of the sash cord, when it is desired to disengage the latter from the sash.

BOHRISCH'S SASH HOLDING AND REMOVING WINDOW BEADS.

Labor Saving Insects.

That certain flies will steal a ride on the back or wings of some larger insect, and that this labor saving process may be habitual, is indicated by the observations of the Rev. A. E. Eaton, who noticed in Algeria a small fly of the Borborinæ group riding on the backs of big coprophagous beetles. They settle down on the prothorax, and on the base of the wing covers, sometimes half a dozen females on one beetle.

"The beetles occasionally throw themselves on their backs to try and get rid of them by rolling; but the flies elude all their efforts to dislodge them, dodging out of harm's way into the joinings of the thorax and out again, and darting from back to breast and back again in a way that drives the beetle nearly mad. In vain she scrapes over them with her legs; in vain does she roll over or delve down among the roots of the herbage; the flies are as active as monkeys, and there is no shaking them off."

A somewhat similar case has been reported by Mrs. Slosson, says The Independent, who observed at Franconia a lacewing fly (Chrysopa), which seemed to have a black raised spot upon each wing, and others with but a single spot. She caught other chrysopas, and in the net with one of them was a minute Cecidomyia fly still clinging to the wing of a lacewing fly. It apparently is a tramp fly, stealing a ride on the larger insects, though the lacewinged flies are not rapid fliers, nor do they fly to a great distance.

THE Westinghouse Electric and Manufacturing Company has received from its European company notice of the award to it by the Metropolitan Electrical Supply Company of the contract for a large electric lighting plant to be installed in London. The apparatus will be of the multiphase type, involving the use of the Tesla patents, which are owned in England by the Westinghouse Company. It is understood that the contract amounts to between $350,000 and $400,000.

Science Notes.

The Prince of Monaco is said to have completed his season's researches in the Azores.

Two new asteroids have been discovered between Mars and Jupiter by M. Charlois, of Nice, bringing the number discovered by him up to eighty-six. Palisa, the Austrian astronomer, has discovered eighty-three.

The Evelyn Baldwin has arrived at Christiania, from Spitzbergen, whence she sailed northward until stopped by pack ice. She reached latitude 80° 45' and secured valuable geological and botanical collections for the American colleges.

An English steamship engineer has recently acquired the distinction of being probably the only man ever bitten by a West African double-horned viper who has lived to tell of it. The doctor kept him full of brandy and injected iodine into the wound. His temperature rose to 107·3.

Further discoveries have been made in the wonderful ice caverns opened up at the foot of Cow Mountain, Colo. Three chambers have been opened, the walls and ceilings being covered with great masses of ice in grotesque forms. In the center of one of the rooms is a lake 40 × 65 feet, with no apparent outlet.

Mr. Harmsworth, who defrayed the expenses of the Jackson expedition in Franz Josef Land, has declared that he will send two ships to the Arctic next season and keep an expedition in the Arctic regions till a complete map can be made of all the accessible parts of the North Polar world. The Jackson expedition has cost him $200,000.

Hon. Charles D. Wolcott, Director of the United States Geological Survey, left San Francisco on September 11, for the Yosemite Valley. He proposes to make topographical maps on a scale of two miles to the inch of all the forest reserves in California, including recent additions, comprising 6,647,000 acres. The distribution of forests will be pointed out on this map, showing the commercial and uncommercial timber, agricultural lands, settlements, roads, houses, etc.

An interesting experiment is to be tried in connection with the Paris Exhibition of 1900. The authorities intend to establish a workmen's co-operative restaurant for the benefit of the men engaged in erecting the exhibition buildings. Arrangements are being made to supply a good meal at a very moderate price. The workmen will have the greater part of the profits divided among them, as well as the dividend, which is expected to reach six per cent of the outlay of each man.

"M. Marey has contributed to the Paris Academy an account, by MM. V. Tatin and Ch. Richet, of trials of an aeroplane invented by them," says Science. "Their first experiments were made in 1890, but the machine was wrecked. A new machine was then constructed, with which the first trial was made last year with some success. In a second trial in June last the aeroplane traveled through the air 170 meters [558 feet] at the rate of 18 meters [59 feet] per second. The machine weighed 33 kilogrammes [73 pounds]. The authors compare their results with those obtained by Prof. Langley, and, while admitting the greater distance traveled by the aerodrome, claim that their machine had the advantage of greater weight and greater speed."

The colors of the different races depend upon the pigment in the epidermis, especially in its deeper strata. M. Breul, a recent French authority, finds according to Science that the coloring matter is in the interior of the epithelial cells, "while even in the negro the intercellular spaces are white. The pigment itself may be quite black, or of any shade up to a light yellow. It may be confined to the nucleolus or extend over the cell. A close examination shows that it is distributed in patches over the skin, between them the tissue being colorless. This is true even of the black races, although in them the patches are close together and may not be discernible unless the skin be stretched. This distribution of the coloring matter is the same in all races, and its actual amount is probably the same, the difference in hue resulting from the darker or lighter character of the pigmentary grains."

The seventh session of the Australian Association for the Advancement of Science will commence on January 6, 1898, the place of meeting being Sydney, says the Lancet. The objects of the association are to give a stronger impulse and a more systematic direction to scientific inquiry; to promote the intercourse of those who cultivate science in different parts of the Australian colonies and in other countries, to obtain more general attention to the objects of science, and a removal of any disadvantages of a public kind which may impede its progress. The president-elect, who also holds the office of permanent honorary secretary, is Prof. A. Liversidge, M.A., LL.D., F.R.S. Besides the general meetings, excursions will be organized to various places of interest in the neighborhood, and this portion of the congress will no doubt be by no means the least appreciated of the proceedings, for the scenery of the Blue Mountains is as beautiful as any in the world.

THE HEAVENS FOR OCTOBER.

BY WILLIAM R. BROOKS, M.A., F.R.A.S.

THE SUN.

The right ascension of the sun on October 1 is 12 h. 32 m. 11 s. and its declination south 3 deg. 28 m. 51 s. On October 31 the right ascension of the sun is 14 h. 14 m. 45 s.; and its declination south 14 deg. 22 m. 4 s.

MERCURY.

Mercury is morning star, and is in perihelion on October 3.

On October 7, at 9 hours, Mercury reaches its greatest elongation west of the sun, 18 deg. 2 m. This would be a favorable time to see Mercury with the naked eye, as well as to observe it with the telescope. On the date of its greatest elongation from the sun Mercury will be about 2½ deg. north of the celestial equator. On October 12 Mercury crosses the celestial equator, moving south.

On the morning of October 6, at 3 o'clock, there will be an interesting and quite close conjunction of Mercury and Jupiter, when Mercury will be only 12 m. of arc north of the giant planet.

This will also afford a splendid opportunity to identify Mercury. On that occasion we shall have the interesting spectacle of the smallest and largest planets of the solar system in the same telescopic field of view.

On October 25, at 7 h. 35 m., Mercury will be in conjunction with the moon, when the planet will be 6 deg. 57 m. north of the moon.

The right ascension of Mercury on the fifteenth day of the month is 12 h. 35 m. 32 s. and its declination south is 1 deg. 39 m. 27 s.

VENUS.

Venus is morning star, and is still a very beautiful object in the early dawn. It comes to perihelion, or that part of its orbit which is nearest the sun, on October 15 at 1 hour.

On October 19, at 4 hours, Venus is in conjunction with Jupiter, when Venus will be 28 minutes of arc north of Jupiter. While the conjunction may not be seen, the two planets will be found quite near to each other on the mornings before and after the conjunction.

On October 23, at 11 h. 16 m., Venus is in conjunction with the moon, when the planet is 6 deg. 39 m. north of the moon.

On the first of the month Venus rises at 3 h. 14 m., and crosses the meridian at 9 h. 50 m. A. M.

On the last of the month Venus rises at 4 h. 20 m. and is on the meridian at 10 h. 8 m. A. M.

The right ascension of Venus on the fifteenth day of the month is 11 h. 41 m. 18 s. and its declination north 3 deg. 35 m. 51 s.

MARS.

Mars is in the evening sky throughout the month, but too near the sun to be visible.

Its position on the fifteenth day of the month is right ascension 14 h. 5 m. 47 s. and its declination south 12 deg. 35 m. 0 s.

JUPITER.

Jupiter is morning star. The interesting conjunction of this planet with Mercury on the morning of October 6 has been referred to in the section on Mercury.

On October 23, at 3 h. 36 m., Jupiter is in conjunction with the moon, when the planet is 5 deg. 55 m. north of the moon.

On the first of the month Jupiter rises at 4 h. 50 m., and crosses the meridian at 11 o'clock A. M. On the last of the month Jupiter rises at 3 h. 15 m., and crosses the meridian at 9 h. 20 m. A. M.

The right ascension of Jupiter on the fifteenth day of the month is 11 h. 52 m. 45 s. and its declination north 1 deg. 57 m. 52 s.

SATURN.

Saturn is evening star, and may still be observed just as soon as it is dusk, low down in the southwestern sky during the first part of the month. Saturn is in conjunction with the moon on October 27 at 3 h. 31 m., with the planet 6 deg. 14 m. north of the moon.

On the first of the month Saturn crosses the meridian at 2 h. 59 m. and sets at 7 h. 55 m. P. M.

On the last day of the month Saturn crosses the meridian at 1 h. 15 m. and sets at 6 h. 5 m. P. M.

The right ascension of Saturn on the fifteenth day of the month is 15 h. 47 m. 27 s. and its declination south 18 deg. 8 m 2 s.

URANUS AND NEPTUNE.

Uranus is still in the vicinity of Saturn, although Saturn is now moving to the eastward of its celestial neighbor.

The right ascension of Uranus on October 16 is 15 h. 39 m. 48 s. and its declination south 19 deg. 21 m. 42 s.

Neptune is in the morning sky. Its position hardly changes throughout the month; for October 16 its right ascension is 5 h. 27 m. 21 s. and its declination north 21 deg. 51 m. 16 s.

ALGOL.

Minima of the variable star Algol will occur as follows, in Greenwich mean time:

	Hours.	Minutes.
October 6	6	27
" 12	0	5
" 17	17	43
" 23	11	21
" 29	4	59

Alternate minima are given above; others can be found by using the period 2 days 20 hours 49 minutes.

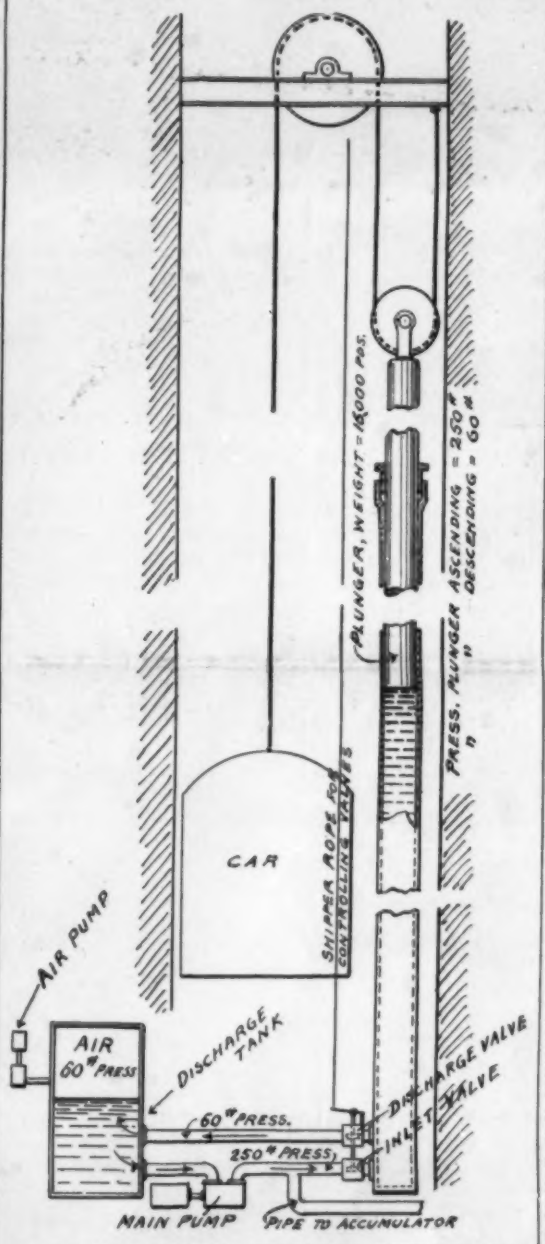
The mean place of Algol for 1897 is right ascension 3 h. 1 m. 28 s., declination north 40 deg. 33 m. 31 s.

Smith Observatory, Geneva, N. Y., September 20, 1897.

THE ELEVATOR ACCIDENT AT THE TRACT SOCIETY BUILDING, NEW YORK.

After a somewhat lengthy investigation of the elevator accident at the Tract Society building, New York (details and illustrations of which were given in our last issue), the coroner's jury found that the accident was "occasioned" by the release of the safety clutches (which, it will be remembered, had been automatically set a short time before the accident); and while they found that no one was criminally responsible for the accident, they recommended that high speed elevators should be at all times in charge of a competent engineer. The latter recommendation was prompted by evidence which showed that "no one who understood the system was in charge at the time."

It will be noticed that the jury was careful to state that the releasing of the safety clutches "occasioned"



SKETCH DIAGRAM OF HYDRAULIC ELEVATOR IN TRACT SOCIETY BUILDING.

the accident, thus leaving the actual first cause of the disaster open to discussion. For, while the finding of the jury was perhaps the only one that could be given on the evidence presented, it leaves untouched the vital question as to what it was that caused the fall of the plunger and the sudden shooting of the car to the top of the shaft. There is every reason to suppose that the disarrangement in the elevator which caused the first rapid ascent of the car, causing it to be stopped by the clutches at the first floor, was the same disarrangement that rushed the car to the top of the shaft the moment the clutches were released. What this disarrangement was is a question which the expert testimony at the inquest seemed very carefully to avoid. At the same time it is a question in which the public is profoundly interested, and upon which it has a right to be well informed. It was stated by one of the witnesses that any attempted explanation would be purely hypothetical; but it frequently happens that the data upon which a hypothesis is founded are so abundant and convincing as to give the conclusion the appearance of a positive certainty.

The accompanying sketch diagram, which, it will be understood, is not drawn to scale, shows the general features of the hydraulic system in use at the Tract Society building. The car is raised by the dead weight of a massive plunger, working in a cylinder 182 feet high, which extends half way up the shaft. When the car is at the bottom of the shaft, the plunger is at the top of its stroke and vice versa. The plunger weighs 16,000 pounds and is many times heavier than the car. It is raised by a hydraulic pressure of 250 pounds to the square inch. The water is admitted by an inlet valve, worked by the "shipper" rope, which passes through the car. The discharge valve is attached to the same stem as the inlet valve and is operated simultaneously by the shipper. The discharge water is not allowed to run to waste, but is led into a closed discharge tank, in which an air pressure of 60 pounds to the square inch is maintained continuously.

It will thus be seen that the plunger in descending is retarded by a column of water which is forced up against it by air pressure in a tank with which it communicates. The feed for the pressure pumps is drawn from the same tank, as shown in the diagram. This arrangement economizes the water, which is thus circulated over and over again throughout the whole system; it keeps the cylinder sealed against the air; and by giving a pressure of 60 pounds on the suction it reduces the actual head pressure against which the steam pistons have to work from 250 to 190 pounds to the square inch. The system is ingenious and economical. We are informed by the chief engineer that during an eight hour Sunday test, in which all the six elevators were kept running continuously, the consumption of coal was 350 pounds per hour and the consumption of water was 28 pounds per horse power hour—a very good performance for this class of work.

It will be seen that the plunger is always resting upon a column of water, the pressure at the base of the column being 250 pounds when it is ascending and 60 pounds during the descent. It is evident that as long as the 60 pounds pressure is evenly maintained the plunger will force out the water and descend at an even speed, but should the pressure in the tank diminish from any cause, the plunger will fall proportionately faster. Should the pressure in the tank fall below a point sufficient to maintain the column of water in the cylinder at the level of the bottom of the plunger, and should the plunger meanwhile be held stationary by some means, the water would fall away from the plunger, leaving a clear space beneath it.

The engineer testified at the inquest that the discharge tank had been leaking for some time, the leak being in the upper joint of the tank, above the water. This was shown by the fact that the air pressure was continually falling, necessitating the use of the air pump. On the day in question the pressure had fallen at one time as low as 20 pounds to the square inch. Turning to the facts of the accident, we find that the car started from the bottom floor and was clutched (because of too great speed) at the first floor. At the moment the clutches acted, the exhaust valve was open and the plunger was descending above the normal speed. That the speed was above the normal is stong circumstantial evidence that the tank pressure was low. Let us suppose that it was, and that it had fallen to the 20 pounds pressure noticed earlier in the day by the engineer. It took from twenty minutes to half an hour to release the clutches, and during this time the water in the cylinder would fall to a level corresponding to the 20 pounds tank pressure, leaving the 16,000 pound plunger hung in mid air, held by the clutches of the car. The instant the ill-fated engineer released the clutches the massive plunger would drop in the cylinder, whirling the car to the top of the shaft with a speed just twice its own. That the car shot up with frightful rapidity is proved by the testimony of an eye-witness, and if the car shot up, the plunger must have fallen with at least half the speed. That the plunger fell is proof that the cylinder was all or partially empty, and if the water was not in the cylinder, the pressure must have been lacking in the tank.

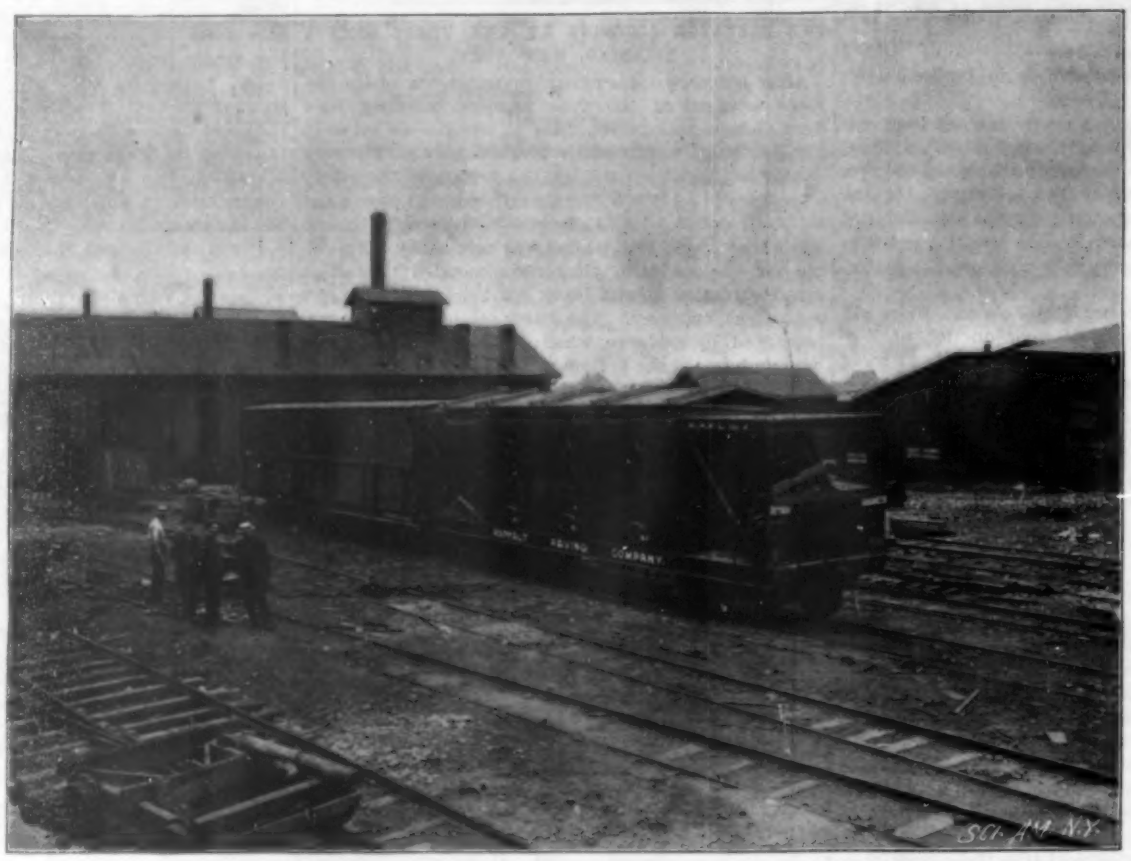
This, it seems to us, is the only possible explanation of the accident. It was the unforeseen coincidence of a clutched car, an open discharge valve and a low pressure that brought about the disaster.

It will occur to any practical engineer that whether this theory be right or not, the safety of this system would be materially increased by placing the air pump in automatic connection with the discharge tank, so that if the pressure should fall, the pump would be started. The elevator system is a good one, being both fast and economical, and the plant, as a whole, is well built. With the slight change we have suggested, it would be proof against another such disaster as was "occasioned" by the releasing of the clutches by the night engineer at a time when the elevator mechanism was out of order.

EXPERIMENTS are being made at Portsmouth, England, with cordite as ammunition for quick-firing guns, for the purpose of determining the visibility of the flash at night and how far it would guide an enemy's fire. Cordite is said to give a much smaller flash than powder.

A NEW DEVELOPMENT IN MACHINERY FOR ASPHALT PAVING.

Since the asphalt street has come to be generally acknowledged superior, in essentials, to all others, the adoption of asphalt for paving purposes has become the rule in all of the more important cities of the United States. The result of competition among contractors for that kind of pavement has been to extend its use, and, at the same time, greatly reduce its cost. Whether or not competition has been largely prevented in the past, it appears quite certain that at the present time any contractor having the necessary experience and capital may include asphalt paving with his other business. Until the present time, however, the asphalt paving contractor has been compelled to limit the field of his operations to only the cities and larger towns of the country, it being practically out of the question for small towns to obtain this pavement, on account of the increased price made necessary in order to cover the cost of a plant which would have to be erected for the purpose of manufacturing the material from which the pavement is made. These being the conditions, it naturally follows that a paving plant which could be easily transported from place to place would open at once a vast new field of work in the paving industry. A portable plant, for practical field work, must combine all of the essential features of the regular stationary type of plant with extreme portability and compactness. It must be simple as possible in its mechanism, without the sacrifice of utility. It must be self-contained and operated with at least as few hands as the ordinary stationary plant. It must be well made and durable, constructed to withstand the movement and jarring of railway transportation without injury. Such a plant, it is claimed, is the one which is shown in the accompanying illustrations and which is the invention of Frederick A. Hetherington, of Indianapolis, Ind. It is known as the Hetherington railway asphalt plant. In the invention of this plant it was the aim to produce a traveling apparatus that would be well adapted for operating upon small contracts.



PORTABLE ASPHALT PLANT READY FOR TRANSPORTATION.

Although the inventor had only hoped, originally, for a working capacity of from 900 to 1,000 square yards of pavement per day, actual field work this season has demonstrated that, as at present constructed, the capacity is from 1,500 to 1,800 square yards per day, and that, by the modification of certain elements of the plant, its capacity may be readily increased to any desired amount. The plant is complete in itself. It contains all of the machinery that the paving contractor requires, excepting his steam roller and street tools. There are no sheds or buildings to erect, yet all parts are amply protected from rain and sun. At the end of the season's work the plant may be finally closed and locked and may stand fully protected without other cover than is provided in itself.

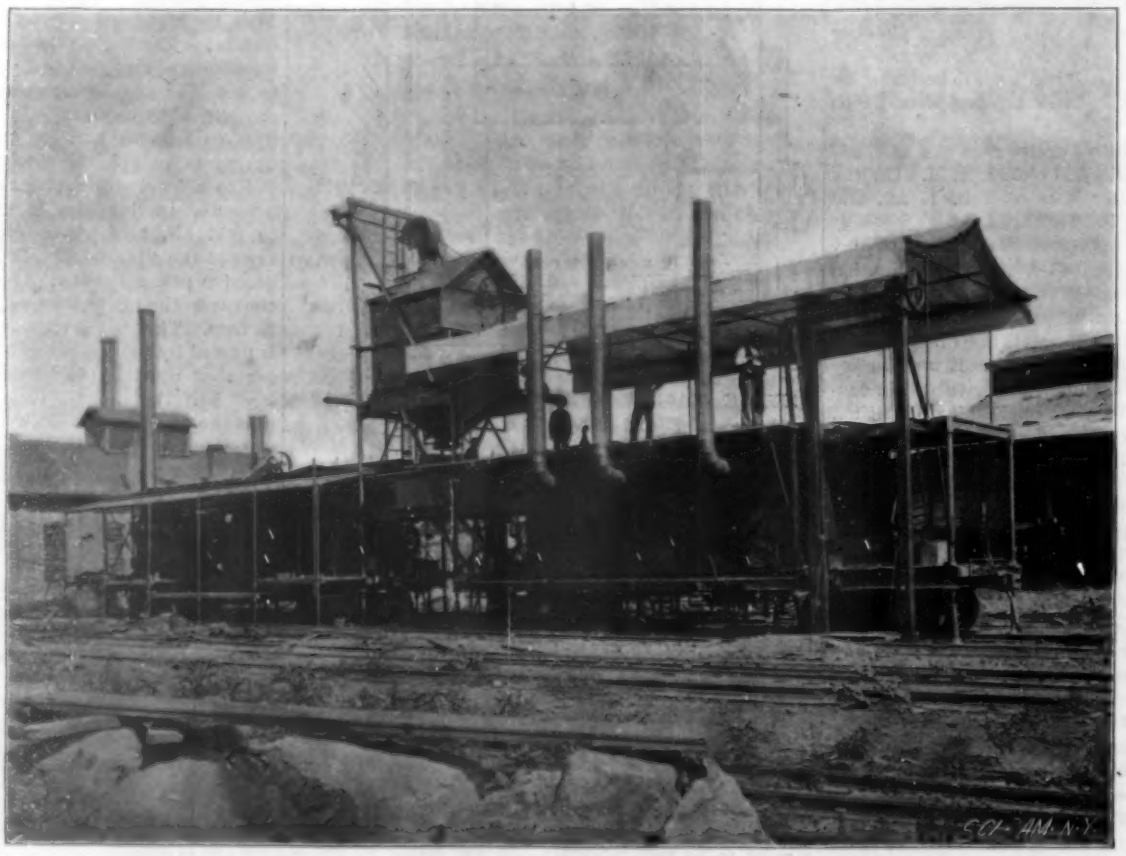
One of the accompanying illustrations shows the plant set up for operation; the other shows it as it appears when packed for transportation. All of the parts that are shown in the second illustration, such as smoke stacks, tower structure, sand bin, etc., are securely packed away in the plant itself, as shown in the first illustration. All such parts are readily detachable, being either screwed or bolted together. But thirty hours are required in making the outfit ready for work; it may be dismantled and packed for the road again in twenty hours' time.

The principal invention which has been developed in the construction of this plant is the central tower, which is constructed of comparatively light weight tubing and steel beams. This tower is situated centrally between the two cars, which are placed end to end upon the tracks; it is connected to, or rather built upon, the adjacent corners of the cars. At a distance of about nine feet from the ground the tower standards support a platform upon which is placed the mixer. This is the machine that mixes the required quantities of hot sand, asphalt and carbonate of lime, that in combination form the cement for pavements. Still higher in this tower is situated a rectangular steel box of considerable size which is called the hot sand storage bin. Beneath this bin, and suspended just above the mixer, is the measuring box, and it contains, when filled, the requisite amount of sand for one charge of the mixer. This feature is in itself a marked improvement over the old method which still prevails in the great majority of the asphalt plants about the country, whereby the hot sand is shoveled by hand into a wooden box that will hold just the quantity required, and is then transferred to the mixer by means of some sort of a track or trolley.

Within the sand storage bin overhead is a revolving screen or sieve. It is the office of this screen to separate the gravel and coarser particles from the sand that is to be used in the mixer.

The two cars are called, respectively, the melting car and the drier car. On one end of the drier car is established the power plant, which consists of one steel boiler of the locomotive type and a steam engine. Besides this machinery there is a steam pump for pumping water and another which is the air compressor. At the other end of this car, and occupying about one-half its length, is the sand heater or drier. This apparatus is the most important element in the whole plant, and its duty is arduous, for it must deliver to the hot sand elevator eight cubic feet, or 800 pounds, of hot sand every three minutes, at a temperature of not less than 310 degrees.

Upon the melting car are established several large kettles and a cylindrical tank called the agitator. These kettles and the agitator, taken together, will hold, when charged, about eighteen tons of melted asphalt. Proper furnaces are provided for melting the asphalt. About the kettles are broad platforms upon which the workmen stand while at work. The arrangement and construction of these platforms is twofold. While they form the floors for the workmen while the plant is established for service, when it is closed for shipment they fold back over the kettles and make the roof of the car.



PORTABLE ASPHALT PLANT IN OPERATION.

Located about centrally of the drier car, and projecting from one side, is the cold sand elevator. This is a link belt elevator carrying metallic buckets. Its office is to deliver the sand from the pile at the side of the car, up and into the receiving end of the sand heater. The construction and novel features of this sand heater cannot at present be described, for the reason that they form the subject of another invention, patents for which are still pending.

OPERATION OF THE PLANT.—Between the adjacent

of the two cars, and beneath the mixer, is a passageway through which a team of horses may be driven. The operation of the plant is described as follows:

Sand is shoveled from the supply pile into the bucket of the cold sand elevator; by them it is delivered into the sand heater, from which it emerges, very hot, into the boot of the hot sand elevator. By means of the hot sand elevator, the sand is carried up into the revolving screen, where all gravel and coarse particles are removed, and it then falls into the hot sand storage bin down through which it finally passes, by means of the measuring box into the mixer. While this sand operation has been going on, the operator at the melting car has opened a valve in a large pipe which projects from the agitator, and has filled a steel bucket with a certain amount of asphalt. As the operator at the mixer lets a charge of hot sand fall into the mixer, the melted asphalt is run from the agitator to the mixer on a short trolley and is poured into the tumbling and tossing mass of hot sand, into which has previously been dumped the required amount of carbonate of lime. The whole batch is then allowed to mix furiously for a short period of time, and then the operator at the mixer pulls a lever which opens a door in the bottom of the mixer, and the whole mass, or batch, as it is technically called, falls into a wagon which stands beneath to receive it. This is the substance that may be seen upon the streets wherever an asphalt pavement is being laid.

The cars upon which this railway plant is established are constructed entirely of steel and are of especial design; they are equipped with air brakes as required by law, and also all other fittings and attachments, including automatic couplers, according to master car builders' standards and regulations. As packed for transportation the plant is of ordinary freight car dimensions and weight and passes all bridges and tunnels. Three of these plants have been built during this summer and their success has been so marked that it is expected that many will be in use in different parts of the country within another year. This railway asphalt plant is manufactured by Hetherington & Berner, of Indianapolis.

VICTORIA REGIA.

Several attempts have been made at Prospect Park, Brooklyn, to raise the Victoria Regia from the seed, but they have failed. The plant illustrated in the accompanying engraving was procured at Philadelphia. It has grown with great rapidity, and now, with its ten leaves, the blossoms and the buds, nearly fills a large lily pond. Our illustration shows the leaves in different stages of development and decay. Several of the leaves are perfect; one or two have broken down around the edges, and a new one at the left is unfolding by unrolling at the edge. The leaves are upturned at the edges like a pan, and underneath is a strong network joined to the stem five to ten feet long. The leaves are four to five feet in diameter. They have been grown to double that size in the Royal Gardens at Kew, where they are grown under glass, and the water in which they are propagated is kept at a temperature of about 80°.

The Prospect Park specimen is growing in one of the out of door lily ponds which is furnished with heating apparatus concealed from view, and arranged to keep the plant at the required temperature. Much anxiety was felt while the bud was developing, lest a chill wind should blast the tender bud, but the weather was propitious and the plant and flower have been seen by admiring thousands.

A few years ago we published an account of the successful raising of this plant at Clifton, N. J., by Mr. S. C. Nash. The Victoria Regia is indigenous to inland South America. It was discovered on the Amazon and taken to England, where it was exhibited at the Crystal Palace. It was named in honor of the Queen. This great lily has been known and exhibited in England for fifty years.

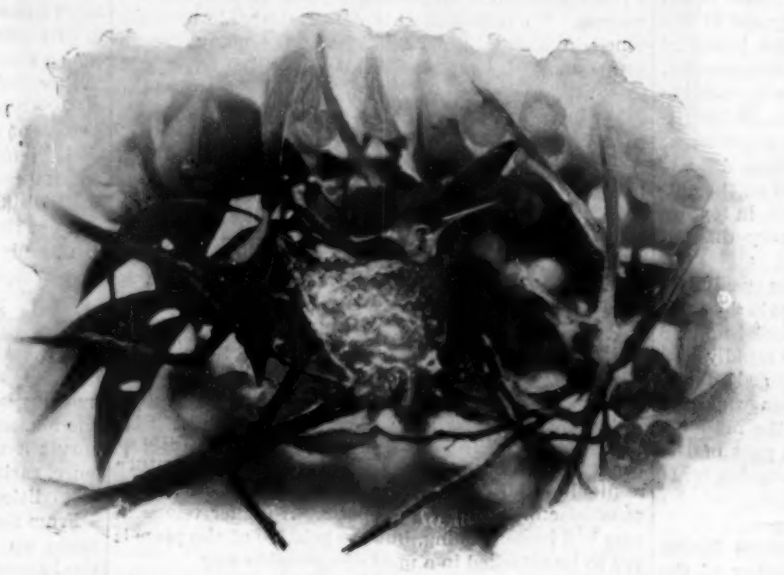
VICTORIA REGIA IN BLOOM.

THE ancient Greek water supply system showed every modern improvement, such as we have acquired only within the last decade.—Monatschrift für Oeffentlichen Baudienst.

TAME HUMMING BIRDS.

BY CHARLES FREDERICK HOLDER.

In Southern California almost every dooryard and garden has its quota of humming birds—among the most interesting of the feathered tribe. I recall hearing John Bell, the taxidermist and naturalist, who was a friend and companion of Audubon, say that he once heard a humming bird sing when lying perfectly quiet beneath a bush. He considered it a novel occurrence, but the humming birds of Southern California certainly utter many notes which may be construed into singing.



THE TAME HUMMING BIRDS OF CALIFORNIA.

My first experience with these little creatures was on the slopes of the Sierras between two deep and well-wooded cañons.

In a little garden belonging to one of the sons of John Brown, whose "soul is marching on," many humming birds congregated, flying from bush to bush the whole day long, glistening and gleaming in the sun like living gems.

One day, when strolling through this semitropic garden, I saw a little brown humming bird watching me gravely from the broken stalk of a wild sunflower. As I gradually drew nearer, it merely cocked its head upon one side and gazed at me in a mildly inquisitive manner until I was within two feet of it, when it flew away twenty or thirty feet. Again I approached quietly, and succeeded in obtaining a position within a foot of the little creature, who appeared fascinated and entirely devoid of fear. I now carefully reached out my hand around it. The little head slowly followed until its gaze was wholly directed from me. Then with the other hand I caught the dainty creature, hoping to keep it as a pet. It was released in a large room, with an abundance of sunlight and flowers, but it became at once so wild and was obviously so unhappy that I gave it its freedom.

My next attempt at cultivating a friendship with a humming bird was with two young birds, a nest and eggs having been discovered on a low branch of an orange tree in my garden. The mother bird was very loath to desert the eggs when I approached and readily submitted to the photographing process, the plate showing the little creature sitting high on the nest, her beak pointed slightly upward. When any one went near the tree the bird did not make the slightest movement, evidently relying on the protective resemblance which she and the nest possessed to a remarkable degree.

Finally, the two eggs disappeared and two reddish impossible creatures took their place; bits of animation which at the slightest movement opened their wide and cavernous mouths for the expectant food. The little birds, which first resembled hairy spiders more than anything else, soon obtained their feathers, and eyed us with gentle curiosity whenever we approached the nest. A rich sirup of sugar and water was now offered them, and found to be very much to their fancy. A drop upon the end of a broom splint would at once become the target for their slender tongues.

As it became evident that the birds would leave the nest in a few days, the delicate structure was severed from the branch and removed to the room of one of the ladies of the house, who now undertook their education. The little creatures almost immediately deserted the nest, taking position upon its edge, with much unsteady fluttering. Then began the first experiments in flying, a rapid vibration of the wings, which merely raised the birds a few inches above the nest. This was succeeded soon after by a short excursion into the air, following the drop of sugar, taking it upon the wing from the hand of their mistress just as they would when feeding from a flower. Two or three experimental days and the birds became perfectly tame. They would alight upon the finger or head of their mistress, come when called, and displayed the most artless and confiding dispositions.

When the nest was taken the mother bird made no protest, in fact, was not seen, but she soon found her offspring. The young birds, two days later, having learned the use of their wings, flew to the window that faced the orange grove and clung to the meshes of the screen with their tiny, delicate claws. Their plaintive squeaking soon attracted the attention of the mother bird, who hovered about the place for several days, endeavoring to reach her imprisoned young, reluctantly flying away whenever one of the household appeared.

It would be impossible to conceive greater confidence than that displayed by the little captives. They were absolutely without fear and courted the closest intimacy. At night they slept on the edge of a basket in a closet in our room, and every morning awakened us by hovering over our faces, uttering sharp little metallic notes; when successful, alighting upon the extended finger, cocking their tiny heads from side to side in an expressive demand for food. At breakfast they frequently flew downstairs, following their mistress, often perching on the sugar bowl or some convenient roost on the table, from which they would watch the proceedings apparently with the greatest interest. The little creatures, hovering in the air and feeding from our hands, presented a charming spectacle.

When called, the pet bird would fly from room to room, evidently understanding its name, and was a constant surprise to lady callers, unaware of its presence. A humming bird, in the family of a friend of mine, met its death by being taken for a gigantic bee. It flew to the gorgeously decorated hat of a visitor, humming about the artificial flowers and following them up as the guest attempted to escape. The latter, finally, struck it down with a fan, only then discovering, to her surprise and dismay, that the supposed insect was a pet humming bird.

Who first conceived the idea of taming so delicate a creature as the humming bird is not known, but it has frequently been done. Old habitues of Taylor's restaurant, on Broadway, will recall the tame hummers which at one time were exhibited in the window and which attracted the attention of hundreds of passers by. The birds were thoroughly tame, and knew the German who caught them perfectly. He fed them by using glass flowers, which were filled with sweetened water.

The question as to the food of humming birds is one that has aroused much discussion, some authorities stating that they live entirely upon the sweet exudations of flowers, others believing that insects form part of their food. I can state that the California ruby throat cannot, in my experience, live on sweetened water alone. It requires minute insects, and, perched upon the fingers of their mistress, our little pets would eagerly hunt for insects on the window pane. Ants they would not notice, but very small gnats and spiders were very much to their liking. I assume that their

food consists mainly of these and other insects, the sweetened dew and exudations of flowers being their drink—a nectar to be enjoyed, perhaps, when other food is scarce.

While but one humming bird is well known in the East, California has seven or eight, most of the genus Trochilus.

While the humming birds are the most delicate of their kind, their powers of flight are marvelous. A friend informed me that he observed one flying about the vessel that plies between San Pedro and Santa Catalina Island, twelve miles from land. This island is famous for its humming birds, and here and at San Clemente, forty miles offshore, is found the beautiful white-booted racket-tailed humming bird (Steganurus).

The art displayed by the humming birds in building their nests is marvelous. The one from which the young birds described were taken was not much larger than an English walnut, formed of the most delicate material, like floss from seeds, and covered on the outside with bits of moss, so that it resembled in texture the branches of the orange tree and was very difficult to see.

At Santa Catalina these birds affect the eucalyptus trees and can be seen about their blossoms in flocks of a dozen. While watching one of these birds I noticed a remarkable performance. The bird rose rapidly to a height of perhaps thirty feet, then plunged down, forming half a circle, uttering a peculiar whistling sound. This was repeated several times, the noise being remarkable. I conceived it to be a part of the courtship of the bird, as several female humming birds were hovering about the spot.

The Development and Toning of Lantern Slides.

Mr. Alfred Stieglitz, of this city, a member of the Camera Club, describes in "Camera Notes" a method of development somewhat unusual. In exposing in the camera the plate is slightly overtimed, then it is developed preferably with the hydroquinone developer until the image totally disappears when examining the plate by transmitted orange light, that is, the image is so dense no light can pass through the plate. It is then rinsed under the tap as usual, and placed in the hypo bath until thoroughly fixed. Upon examining the fixed slide, it will be seen that it is not only so thick that you can hardly recognize the picture, but that it lacks all gradation, in being muddy and flat. But this condition is necessary for future operations, all of which take place in broad daylight. On a table place two white porcelain dishes. The one, which we distinguish by calling it A, should contain a one per cent solution of ferricyanide of potassium and the other, B, a very dilute solution of hyposulphite of soda and ferricyanide of potassium, say:

I. 10 per cent solution of hyposulphite of soda.

II. 10 per cent solution of ferricyanide of potassium.

For use, take 100 parts of I and 15 drops of II.

These baths must be renewed occasionally, as they deteriorate in the light.

In each dish place a small camel's hair brush and a wad of cotton, which latter may be shaped at will to suit the purpose for which it may be intended. If possible, have the table near running water; otherwise have a pailful at hand, as plenty of water is essential for the delicacy of some of the operations to be performed.

Local Reduction in Order to Build up Tone Values.—As before stated, in examining the fixed slide by transmitted light, very little of the image will be visible. In order to facilitate matters, bring the slide *directly* from the fixing bath, *without previous washing*, into dish, A, in which it will be gradually reduced. Stop the reduction as soon as the image is fairly distinct. This is done by plunging the plate into water, thus stopping all chemical action. The slide is still very thick and flat, but it is now in a satisfactory condition for local treatment and the ultimate thinning down to the desired density.

In this state the slide is placed in dish, B, and local reduction by means of the brush is begun. This process must be very gradual, so that it be in our power to alter our relative tone values or gradation at will. You notice in this local application of the reducing agent we in reality have the reverse of brush development in platinotype printing, with even a much greater leeway. The process of producing slides by this method is highly interesting, for effects not otherwise possible can, with a little skill, be obtained.

It is by this method that some of those striking snow scenes, shown during the winter, were produced. Originally the slides of these were considerably overtimed and overdeveloped, and then reduced in the above described manner. Between every stroke or two of the brush it is well to rinse the plate, so that the strokes do not show in the ultimate result. No brush strokes ought to be visible when the slide is thrown on the screen: if any be detected, the slide is a failure and ought to be discarded. With a little skill and practice this method is very simple and safe, and any one having succeeded in mastering it will never resort to any other method of producing slides.

Naturally, it is essential to know something of tone values, as the resulting slide might otherwise be ludicrous in its effect. This process of developing a slide is necessarily very slow, forcing being at no stage admissible, as it would insure certain failure.

The Use of Formalin.—In winter the gelatine is sufficiently tough to withstand this seemingly rough treatment, but in summer it is well to soak the slide before the brush reduction is begun in a very weak solution of formalin for about a minute and then rinse thoroughly. The solution used by me is one thousand parts of water to one part of formalin. Sometimes the resulting color of the slide produced in the above described manner is objectionable and possibly rather uneven. To overcome this defect, the slide must be toned in a suitable bath. Among the many experiments made by me, the following will interest you most:

Toning.—In many cases it is desirable to color a slide to a pure blue, or perhaps only a suspicion of blue. An absolutely reliable method to obtain this color is to use the following bath:

Blue.

I. Sulphocyanide of ammonium	300 gr.
Water	32 oz.
Carbonate of soda (granular)	2 gr.
II. Chloride of gold (brown)	15 gr.
Water	1 oz.

For use take 2 ounces of I and 4 drops of II, always remembering to add II to I, and *never reversing* the operation. This amount of solution will tone at least one slide to a perfect blue. The toning bath, in order to work satisfactorily, ought to have a temperature of 72° to 76° Fah. Using the bath at a lower temperature results in failure, as the toning proceeds too slowly and unsatisfactorily in other respects. A higher temperature will hasten toning, but the gelatine of the plate is apt to be attacked in a most disagreeable way.

To judge the process of toning, it is necessary to examine the slide by transmitted light, using daylight if possible. A thoroughly toned slide will have a pure blue color when examined in that way. According to my experience, it is advisable to tone reduced slides after they have been dried, especially in such cases in which only partial toning is to be used. As for the density of toned slides, let me say that those toned with the above bath do not increase in density perceptibly.

Green.

In order to obtain a green slide, the following treatment is best:

I. Oxalate of iron	20 gr.
Ferricyanide of potassium	15 gr.
Water	32 oz.
II. Chromate of potassium	5 gr.
Water	16 oz.

Bathe your slide, which in this case must be somewhat lighter than the desired result, in solution I. In this bath the color will turn to a dark blue. From this it is placed in solution II for a minute and then dried. When dry the slide will be a bright green.

Bartolozzi Red.

Bartolozzi red is obtained by using the following bath:

I. Ferrocyanide of potassium (yellow prussiate)	15 gr.
Water	16 oz.
II. Nitrate of uranium	30 gr.
Sulphocyanide of ammonium	150 gr.
Citric acid (crystals)	30 gr.
Water	16 oz.

For use, take 1 part of I and 1 part of II, and place your slide, which must be first thoroughly soaked, in this solution. It will quickly assume a beautiful Bartolozzi red color. In many cases the whites are stained in coloring the slides in this way, and in order to remove the same, dip them into

Carbonate of soda	15 gr.
Water	32 oz.

for a moment, not longer, and the stain will disappear. After this operation proceed to wash.

Partial Toning.—In using the gold toning bath some beautiful effects of color may be obtained by so-called partial toning. These colors are obtained by dipping the slides into the toning solution for a short time and then examining them by transmitted light. The combinations of the original ground color of the slide and the partial deposit of the gold, which is blue, give us quite a range of purples, blues, reds, grays, blue-blacks, etc., the color depending upon the ground color and the length of toning. Many of the snow scenes before mentioned were treated in this way.

Local Toning with Different Baths.—While experimenting with the above mentioned and many other coloring processes, it struck me to try and color slides by using these baths on one and the same slide locally. In order to succeed, quite a little skill in handling the brush and the various solutions, as well as the water faucet, are essential. And even at that, most slides are apt to be spoiled by the colors running into each other. My mode of procedure is as follows: I take a dry slide, dip into water so as to simply moisten the surface of the gelatine, and then apply the gold toning solution with a small or large brush, as the occasion may require, to those portions of the slide which are to be colored to blue, and shades of the same, and also the blue-blacks and purples, all of which are obtained by the sulphocyanide bath. After these portions of the slide have been colored satisfactorily, an operation which is most trying to one's patience and nerves at times, the other portions are treated successively with the various remaining baths. In most cases the results are exaggerations and also crude; nevertheless such a slide, especially from a chemical point of view, is of great interest. In certain instances, however, such local coloring or toning is of great effect and beauty, especially if the original ground color of the slide be kept and another color simply suggested in parts. Some of the Venetian scenes in which water, sky and a few houses and gondolas make up the picture, treated in this manner, show up beautifully.

As a general rule, the monochrome slide is preferable to those colored by any means whatever, especially for pictorial purposes. Nevertheless, an occasional suggestion of color, if used very discriminately and with understanding, relieves the monotony of an evening's entertainment of slides, always remembering that by colored slides I refer to photographically colored ones, and not those tinted by hand with aniline dyes. Those can hardly be included within the limits of legitimate photography.

English Sales of Rare Books.

In the Athenæum, under the title "The Book Sales for 1896," an endeavor is made by Mr. J. H. Slater to find out how much a library brings when put up at auction, and how much for each book. By a book is meant a work of merit, distinguishable for its excellence, rarity or binding, or because it happens to be a first edition. Only first class collections are considered.

From the Book Prices Current the following has been made up as to the year, the number of books, the total amount paid for all of the books, and the average per volume:

	Lots of Books.	Realized.	Average.
1893	40,671	£66,470	£1 6s. 7d.
1894	51,106	72,472	1 8s. 5d.
1895	45,431	71,229	1 11s. 4d.
1896	47,966	80,111	1 13s. 10d.

It is noticeable that, with fewer books sold in 1896 than in 1894, the average for the last year was larger by over 5s. The particularly valuable libraries that were put up at auction may account for this, and with the sale of the Ashburnham collection this year it may be that the average reached will be still higher, because that library contains so many prized volumes.

At the William Stuart sale, in England, of March, 1895, 215 books brought £4,297, or about £20 per volume. The Syston Park library brought £14 per volume and the Beckford collection £8 per volume. In the Stuart library the high price is accounted for by the sale of four manuscripts, which brought £1,700, and six printed volumes, for which £1,000 was paid. In 1895 the rate of price might have been less than £1 11s. 4d. per lot, except for the fad that some first editions of Chaucer, and imperfect ones at that, brought £2,900.

Fashion in regard to first editions seems to have somewhat passed away in England; that is, so far as it relates to modern writers. First editions of Dickens, Thackeray, Lever, and Jeffreys were not worth as much in 1896 as they were in 1895, and Mr. Slater intimates that if they can be had at reasonable prices to-day, these first editions are good purchases. They will never be plentiful.

Mr. Slater tells of some rare books sold last year, and among them Eliot's Indian Bible. As all book collectors know, a great thing is to get a copy of this Indian Bible with its dedication. When Lord Chancellor Hardwicke's library was sold, in 1888, a perfect Indian Bible, with the dedication, and in a contemporary binding, brought £580. For a copy without the dedication £82 was given this year.

D. W. C. Hoover, Inventor of Photographic Devices.

We are informed of the death of D. W. C. Hoover, at Cayuga Island, near Buffalo, New York, especially well known among photographers and the photographic trade for his ability as a skillful demonstrator in photographic manipulation and noted for his several inventions and improvements in photographic apparatus, among which may be mentioned the Hoover shutter and a machine for rapidly exposing prints on bromide paper, besides special machinery for coating and preparing such paper and films.

At the time of his death he was engaged in perfecting a special film for use in ribbon photography. His formula for a pyro and potash developer known as the "Hoover developer" gained for him quite a reputation among photographers; he also invented special devices for the saving of gold and silver from photographic wastes. His inventive talents were not confined wholly to photography, as in the last year or two he designed a steam yacht of a special model named the Vixen, and had the machinery constructed after his own ideas, with a view to securing greater speed. His practical way of conducting photographic operations and his readiness to aid photographers striving to learn new processes were his noteworthy characteristics.

THE HOUSE OF THE VETTII AT POMPEII.

The excavations at Pompeii have for quite a long time been uninteresting; commonplace houses, amphoræ and human remains have been found, but nothing of special note. At last, in 1894, the House of the Vettii was discovered at Pompeii, and the excavations have been continued during the last two years. The excavations which led to the discovery of this important house were in what was known as the Sixth Region, at the north of the city. It was soon discovered that it was the habitation of a Pompeiian of rank and that the house was one of the greatest importance. The removal of the rubbish was conducted with all possible care, and the result was that the house, which was one of the most interesting in Pompeii, has been kept in the most excellent state of preservation. The authorities who have charge of the excavations made the necessary repairs to the roof and pillars and restored the gardens. Contrary to the usual course, the paintings and statues were not removed to the museum at Naples, but were left in situ. It is a matter of history that the Vettii were among the principal citizens that Pompeii numbered in the year 79 A. D. All the Vettii then occupied or aspired to high municipal offices, so that it is little wonder that their house rivals the finest specimens of Roman habitations with which we are acquainted.

KITCHEN, HOUSE OF THE VETTII, POMPEII.

The house is a large one, having a ninety-seven foot front. Near the entrance is found the room of the doorkeeper, with two wall paintings in it. There are two atriums, and the dining room was on the second floor. Beyond the tablinum is a great court with eighteen Corinthian columns and at the foot of each column is a statue and fountain, the water being supplied from the street.

There is another small court adjoining this one, and there is also another dining room with many pictures of Cupid and Psyche on the walls. The peristyle, which we show in our engraving, contained many statuettes and fountains and various tables, some of them with hollowed surfaces and some with circular tops supported by griffins. All of these are of white marble. The frescoes on the walls vary greatly. Some of them are among the finest which have ever been obtained from the wonderful buried city, while others are wretched. All of them help, however, to give an idea of what the Roman painter of the time considered as the proper scheme for a decoration, and as such they are very valuable memoranda.

The entablature in the peristyle is nearly intact and the columns are well preserved. The action of the government in leaving each of the decorative features of the house intact almost doubles the value of the house to the archæologist, to say nothing of the casual visitor. The Vettii might also live over again their old life in their house. They would find again in the interior garden of their habitation the groups of flowers which they may have contemplated on the morning of their catastrophe. Most of the houses in Pompeii look so bare and desolate that this house is a great relief.

Our small engraving shows the kitchen, with the bronze kettle on the hearth in the exact position in which it was when it was overwhelmed by the shower of ashes. Some other metal vessels will be noted at the right of the engraving. The large white object in the center is the front of the oven. It is composed of cement.

One reason that the remains which are found at Pompeii are so interesting is that the city had been destroyed by an earthquake some sixteen years before the eruption, so that the entire city shows the taste of one epoch. Pompeii was reallya summer resort, and is comparable to something between Newport and Long Branch.

Robert Edwin Dietz.

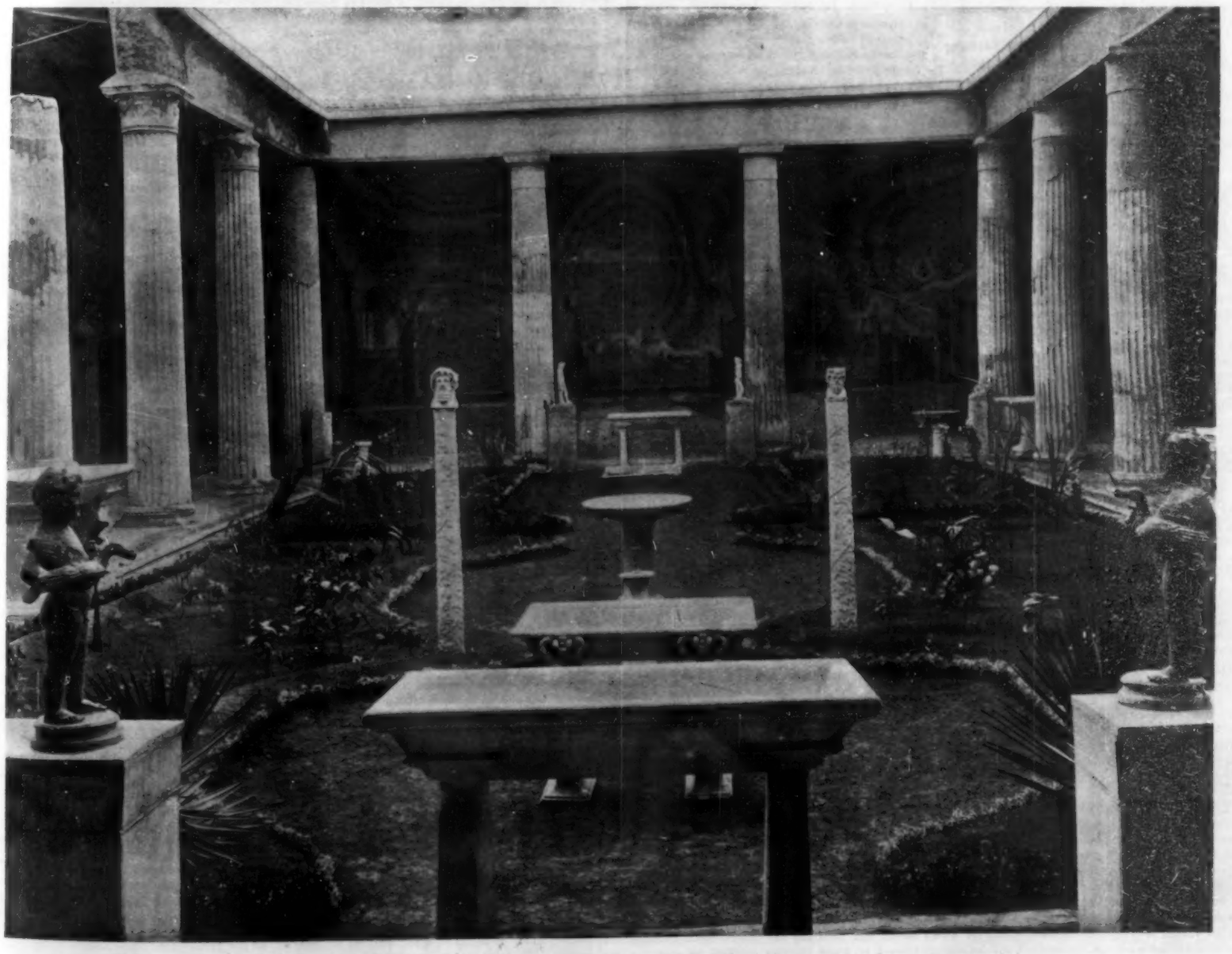
Mr. Dietz, who died in his ninetieth year at his home in Hempstead, Long Island, N. Y., on September 19, was noted for his energy as a manufacturer and promoter of improvements in the city of New York. He survived six brothers and three sisters. He began business in a hardware store and in 1840 started in the manufacture of lamps, burners, gas fixtures, etc., being a pioneer in this line.

When the famous opera singer, Jenny Lind, first appeared in America, the contract was awarded to Dietz Brothers & Company to illuminate Castle Garden for the opening, and when the great showman, P. T. Barnum, opened his first museum, on the southeast corner of Broadway and Ann Street, where the tall St. Paul office building now stands, his firm had the contract to fit it throughout with gas fixtures.

When coal oil, or kerosene, first came into use, he and his brothers, in 1857, invented the first flat wick chimney burner. In 1868 Mr. Dietz took up the manufacture of a new hand lantern called the tubular, which has largely superseded all other kerosene lanterns and has a world-wide reputation.

The R. E. Dietz Company, of which Mr. R. E. Dietz was the founder and former president, are large manufacturers of lamps, lanterns, etc., in this city, having branch houses in Chicago and London, England, and give employment to several hundred men.

THE articles of incorporation of a ship canal to pierce the Florida peninsula have been filed in New York State, the capital being $75,000,000. The assent of the Tallahassee Legislature has been secured and there seems some possibility of the canal being built, still a $75,000,000 canal for Florida would be an ambitious enterprise, in view of the fact that the Erie Canal only cost about $51,000,000 and the Suez Canal $101,000,000. The projectors say that the canal would be of the greatest importance to the commercial interests of this country. The width of the waterway will be 200 feet through its entire length, and it is thought that it will take five years to complete the canal.



PERISTYLE OF THE HOUSE OF THE VETTII, POMPEII.

RECENTLY PATENTED INVENTIONS.

Engineering.

FLOATING OR SUBMERGABLE DOCK.—Manuel Gustavino, New York City. This dock is designed not only for raising sunken vessels, but also for repairing vessels afloat. It is U-shaped and formed of a series of watertight compartments, with the base or wider portion downward, valves for the introduction of air and expulsion of water from the compartments, and a series of hydraulic lifts for handling the vessel to be raised. Adjustable struts are provided for supporting the vessel in upright position in the dock, combined with which, also, are screw propellers operated by engines driven by compressed air, the whole construction being designed to reduce the work of handling sunken vessels to simple and positive operations, at a minimum of expense and risk.

DITCHING MACHINE.—David K. Smith, Pico Heights, Cal. In machines operated by traction engines, and with a plow for forming the ditch, this invention provides certain improvements, whereby, as the engine with its equipment is made to pass along the ditch, the operators standing on the platform may control the plow, the depth of digging being regulated by means of cables and a drum, while, through adjustable end sections, the desired cross sectional form may be given to the ditch, this being effected by the movement of the plow transversely in its guides, although the machine may be operated without the plow guide.

Railway Appliances.

RAILROAD RAIL CHAIR.—Maurice Lewis, West Grove, Pa. For the efficient connection of rails with the cross ties, and at the same time afford an elastic cushion between them, this inventor employs a series of superposed metallic sheets or plates as a cushioning medium for each chair, there being on the series of each chair a metallic cap piece on which rests the outer ends of the clamping plates, whose inner ends engage the base of the rail, the whole being held in position by bolts passed down through the tie.

RAIL FASTENING.—Wallace C. Kemble, Trenton, N. J. To obviate the necessity of driving spikes into the tie, and yet hold the rail in such manner that it may be readily released, according to this invention, a plate is made with upwardly projecting lugs, adapted to engage or disengage the rail base by being revolved on a pivot, the pivot bar extending through the tie, and being engaged by spring catches to hold the bar securely when the top plate is locked to the rail base, and disengage itself when the plate is revolved. A plate carrying the means of engaging and locking the lower end of the pivot bar is located beneath the tie.

STATION INDICATOR.—George S. Weaver, Albany, N. Y. This is a device arranged in a suitable casing to be fixed near the end of a car, there being in the casing rollers on which is a belt containing the names of stations on the route. The conductor, brakeman or driver is enabled to readily move the belt to bring the names of the stations in order before a suitable opening in the casing, as the car reaches or leaves the several stations, the device acting automatically to prevent the belt moving backward.

CAR COUPLING.—Henry G. Harrington, Magnolia, Ark. In this device the drawhead has a link seat which is entirely housed, with an incline or depression at the back end of the seat, and a central rigid core. The coupling bar is shouldered, and a depression block is arranged for vertical movement behind the link core, with means for operating it to lift the link and uncouple the cars. The device is adapted to effect the coupling automatically without the necessity of trainmen going between the cars, is adapted to couple with cars having the ordinary drawhead and pin, and gives the same ease of movement that is obtained with the old-fashioned link and pin.

TOOL FOR TRIMMING OFF TREENAILS.—Albert Collet, Paris, France. Where externally threaded hard wood treenails are used to consolidate the screws, clamps or spikes in railway sleepers, it being necessary afterward to cut off the projecting head of the treenail level with the sleeper, this invention provides, as a cutting off tool, a kind of circular plane formed by a piece of cast metal having in its lower face a circular flange to take support on the sleeper when the cutting edges are at work, and prevent the cutting edges from penetrating into the treenail below the surface of the sleeper. The core of the tool has a square head in which fits the operating key, and in its under face is a dovetailed slot, in which fits a knife with a number of cutting edges.

Electrical.

CONDUCTOR.—James Swinburne, London, England. This patent is for a conductor made of electrically deposited zinc or other metal, which is then compressed to increase its density and tenacity, it being claimed that zinc conductors may thus be made, in many cases, to be more economical than copper for a given amount of conductivity. It is also claimed that the evil effects of self-induction, or skin effects, are reduced, and that such conductors are more economical when subject to corrosion by electrolysis.

ELECTRIC TRAP.—George B. Vaughan, Kirkwood, Mo. This is a trap for nocturnal insects, and has a platform which is accessible from any direction, but which constitutes one terminal of an open electric circuit, a bait holder constituting the other terminal of the circuit, and the arrangement being such that when the body of an insect comes in contact with the bait holder and platform the current will pass through its body and instantly kill it.

TROLLEY WIRE HANGER.—John F. Faulkner and Boyer Campbell, San Antonio, Texas. This invention provides a clamp for trolley wires designed to obviate all danger from broken insulator bolts, and consequent damage to the trolley, the wire, and the span wires. An upper and a lower or removable jaw are attached to the insulator by means of a screw, and by rotating the screw, when the parts are applied to a wire, the lips of both jaws are made to firmly clamp the wire. The device is easily and quickly adjusted, without calling for special skill in the workman.

Mechanical.

SHOE SEWING MACHINE.—Adam H. Prenzel, Landingville, Pa. Two patents have been granted this inventor for improvements in machines for making "turn shoes," or that class of shoes in which the soles are stitched to the uppers while the shoe is turned wrong side out, the shoe being afterward turned right side out. The sole is channeled along its edge to form an overhanging lip, against which the edge of the upper and lining are pressed by a breakdown bar, giving room for the curved needle to enter, when a looper throws a loop of thread around the barbed end of the needle, forming a stitch as the needle is withdrawn. One of the patents provides improved means for feeding the shoe past the needle, and for bending down the outer edge of the sole to give more room for the curved needle to penetrate its channeled edge. The machine is designed to be very simple, durable and economic in its construction.

SKIM PRESS.—Rudolf Ruetschi, Argentine, Kansas. To rapidly and properly separate skim, dross, or metal alloy, from molten lead or other metal, pressing the skim to remove from it any adhering molten metal, and then removing and dumping the pressed refuse, this inventor has devised an apparatus movable to and from the kettle by means of a hanger on an overhead rail, by which an open work basket or cradle may be moved into and out of the kettle, to receive the skim and dross, and which in its upward movement meets a fixed platen by which the skim and dross are pressed, the molten metal passing back into the kettle. The quick action of the press, bringing the material under pressure when hot and soft, proves very efficient.

CURRENT MOTOR.—Asa B. Frame, Boyden, Iowa. This is a motor designed to be operated by the current of a stream of water, to run pumps or other machinery on land, the construction being such that the current bears both on the receiving and the discharge side of the wheel. In a suitable frame is supported a vertical shaft from which radiate spokes supporting blades, an eccentric on which is an eccentric strap surrounding the shaft, and rods connecting the eccentric strap and the blades. As the wheel turns each gate or blade assumes an angle of about forty-five degrees when at the side of the wheel where the current is received, and also at the side where the water is discharged.

Agricultural.

HAY RAKE AND LOADER.—Samuel M. Jenks, Madison, South Dakota. This machine is made to pick up the hay cleanly and thoroughly from the ground and automatically deliver it to a traveling platform provided with pickers by which the hay is carried upward and forward to be received by a transverse conveyer, by which the hay may be delivered at the desired elevation, or to a receptacle at the side of the machine. The rake head is of special novel construction, and may be used with a horse hay rake. All the conveyers and the elevator are driven from the driving gears of the rear supporting wheels, and there is but little and very simple intermediate gearing.

COTTON PICKER.—David S. Deaderick, Mammoth Springs, Ark. A wheeled frame adapted to be moved over a field is provided, according to this invention, with picking devices, preferably in the nature of endless bands arranged to engage the bolls of the cotton plants and remove the fiber, there being means for guiding the plants to the pickers and for cleaning the cotton from the pickers and delivering it to distributing devices. The picking devices are made somewhat yielding to accommodate themselves to various positions of the plants, and the picked cotton is free from dirt or foreign matter, as the picker cloths or aprons do not retain such substances, the cloths themselves being protected from damage or soiling by contact with earth, stones, etc.

Miscellaneous.

ADDING MACHINE.—Wm. J. Ensworth, 337 W. 11th St., Erie, Pa. This invention is for an apparatus the prime object of which is to provide means for casting individual sums into an aggregate without the use of complicated movements and such other fixtures as tend to produce an expensive machine. Such an object is attained with great efficiency by the combination of a suitable register, for showing the total, with a system of differential gearing, each element of which gearing imparts to the register a characteristic movement. These movements respectively represent the individual amounts that are to be added; and, consequently, as these movements are applied to the register, the register shows accurately the aggregate of the individual sums. The gears employed are of two divisions: the numbers under ten are struck by pawls carried on key levers and engaging ratchet wheels, and the numbers ten and over are struck by toothed sectors having knuckle-joint connection with their key levers and meshing with pinions the teeth of which vary according to the numbers which the pinions represent. Both the ratchet wheels and the pinions transmit their movement to the register, so that the total is indicated. The claims cover the two divisions of gearing both separately and combined, so that under the patent the machine may be made with the two divisions of gearing combined, or, should it be advantageous, with either division separately.

GRAIN ELEVATOR.—Emile Blanchard, Paris, France. This invention provides a continuously acting apparatus by which the grain is drawn up from any point in a vessel and delivered on a wharf or elsewhere by pneumatic propellers, which consist of air-tight chambers connected with suction and compression air pumps, an automatic distributing apparatus being so applied to the propellers as to assure the communication of each chamber in turn either with the air and grain suction pipes or with the compressed air and grain delivery pipes. The elevator may also be employed for transporting grain, etc., from one place to another.

TYPEWRITER RIBBON FEED.—George A. Bolb, New York City. A ribbon feed mechanism devised by this inventor is of simple construction and wholly free from the key levers, much reducing the amount of finger pressure required for operating the keys. In the step by step movement of the carriage an actuating plate is moved to draw upon a flexible connection whereby a sleeve is rotated to turn one of the ribbon wheels, the movement of the carriage back in the ordinary manner causing a spring to rotate the sleeve backward.

PAPER BOX.—Joseph C. Hewitt, Montclair, N. J. A fastening device for paper boxes, provided by this invention, is designed to afford a sufficient area for securely fastening the flap, making a very neat box which can be secured with a minimum of labor. The invention consists essentially in dividing the tuck flap into two parts, one of which may be inserted beneath the side of the box and the other pasted to its outside.

COPY HOLDER.—Frank Jones, Marion, Kansas. This device comprises a set of feed rollers which are adapted to receive between them a sheet of copy, or when the copy is a book or set of sheets fastened together they will receive between them a tape or band connected to a guide or rule movable over the surface of the copy. The feed rollers are given a step by step advancing movement by means of a ratchet driving connection from a spring-returned rod, provided with a key and depressed by hand. The device is designed to facilitate copying all kinds of writing or printed matter, whether in books or sheets.

SHIP'S FORM.—Otto Hartwich, Swinemunde, Germany. This invention proposes to modify the shape of a vessel's bow so that it will divide the water horizontally instead of vertically, one portion of the water being deflected upward and the other downward. At the bow is a broad forward projection under the water line, presenting a horizontal dividing edge, and the hull is made with a transversely vaulted concave bottom, the concavity extending forward to the projection. The vessel also has a bottom rudder immediately behind the bow, occupying part of the keel space, and completely protected by the bottom.

LOGGING TRUCK.—John W. Smith, Columbia, Fla. Secured by yokes on the upper side of the metallic axle of this truck is an I-beam, whose lower side is curved to lie snugly against the curved side of the axle, while a chain block rests on the upper flange of the I-beam, and has parallel ribs forming a channel through which the chain may pass. Secured to the front face of the I-beam is a collar in which the rear end of the pole is fitted, the pole being braced on the beam by means of channel irons, and the whole construction is very strong and economical to manufacture.

TANNING.—Charles O. Shaw, Cheboygan, Mich. To facilitate the quick tanning of heavy hides in a drum or wheel, this inventor provides such drum with a coil of pipe in its lower portion for heating the tan liquor, which is forced in under pressure, and centrally in the drum is a reel on which the hides, connected together end to end, are adapted to be wound quite close together, thus filling almost the whole interior of the drum, which is then revolved by power from a shaft extending to the outside. The pressure of the liquor in the drum is regulated by weighted valves on the outlet pipe, and the hides while being tanned are held by the reel in a fixed and well smoothed out position. It is preferred to employ a series of connected drums, the first of the series receiving the stronger liquors, which become weakened by parting with their tannin in passing through successive drums.

VEGETABLE CUTTER.—Oscar A Bulette, Chicago, Ill. To facilitate the cutting or slicing of vegetables, fruit, etc., this inventor has devised an improvement on a cutter formerly patented by himself, comprising a holder for the blades, whereby the blades and holder will be of unequal contractability when cooling, the blades being tightened by this property of the holder and preventing any buckling of the blades during the tempering operation. A subsequent galvanizing or tinning, in addition to forming a protection for the cutter, operates as a hard solder to firmly unite all the joints of the cutter.

WAGON STEP AND CHAIR.—Henry G. Harrington, Magnolia, Ark. This is a combination device which can be used as swinging wagon step adapted to be hung on the wagon body or adjusted as an ordinary step ladder to be used independent of the wagon, being also foldable to form a convenient seat. The several parts are simple and inexpensive and may be quickly adjusted according to the desired use.

MARBLE FOR RELIEF PRINTING.—John G. Weaver, Salt Lake City, Utah. To prepare onyx marble for use in relief printing, this inventor first applies the design with an ink composed of gum elemi, mutton tallow, soap, beeswax, lampblack and turpentine, then dusts over with dragon's blood and ground asphalt, to be incorporated with the ink by flame, then paints the ends and back of the stone with an acid resisting varnish, and then etches the exposed surface in a bath of water, gum, turpentine, nitric acid and sulphuric acid, finally removing the ink off the design and cleaning the stone.

STOVE.—William S. Nicolson, Salisbury, N. C. This stove has a casing extended above its top and forming a drum chamber with lateral air inlets, there being also in the drum section upper and lower plates, a baffle plate extended within the drum section, through which also lead air flues, while the smoke flue projects from the body of the stove upward into the drum section, the construction being designed to promote the strongest possible circulation of heated air, to heat a room with the least expenditure of fuel.

WIRE STRETCHER.—Walter Z. Brannon, Brazos, Texas. This invention provides a simple and inexpensive tool which may be applied to a wire and supported on a post, or maintained in working position between posts or uprights, to bring the wire under any desired tension in a quick and convenient manner. A lever has shifting connection with a draught rod mounted to slide on a support, the wire being connected with the draught rod by a clamping arm and keeper, while a check nut and keeper at the side of the lever are arranged to prevent the movement of the draught rod in one direction.

NET HOLDER.—Samuel A. Alling, Homer, Minn. A holder for a bed, mattress or net, to be used as a life-saving device, according to this invention, is so constructed that it may be folded to occupy but small space when not in use and quickly placed in position for use when required. The receiving surface yields under the falling weight received, but does not rise to cause a rebound of the body, although the net or bed may be readily restored to its upper or normal position by persons standing at the base of the device.

ADJUSTABLE COUCH.—William Edeler, Brooklyn, N. Y. This couch is made of tubing and fittings, and has body and end sections adapted for adjustment relative to each other to form a sofa, a lounge with a head rest at the right or left, or as a bed, provision being made for readily securing the mattress in position, and the entire construction being simple, durable and inexpensive, a spring mattress not being needed.

GAME APPARATUS.—Dallas Du Bois, Montclair, N. J. In a cross channel or groove in a turntable, located centrally in a tray having a flanged margin, is sufficient space for five disks or chips, and in each end of the tray are compartments for other disks, the several sets of disks being of different colors, but the end compartments having each a blank space. The game consists in moving the disks through the spaces in the turntable from one end of the table to the other, by displacing one with another until all have been so changed and the disks in the middle spaces of the turntable returned to their original position.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co. for 10 cents each. Please send name of the patentee, title of invention, and date of this paper

SCIENTIFIC AMERICAN BUILDING EDITION

SEPTEMBER, 1897.—(No. 143.)

TABLE OF CONTENTS.

No. 1. Plate in colors, also another perspective elevation and floor plans of a residence at Bensonhurst, L. I., recently erected for Mr. Walter Jones. A design treated in an attractive style of architecture, with Colonial feeling and classic detail. Architect and builder, Mr. Walter Jones.

No. 2. A Colonial residence at Springfield, Mass., recently completed for Mr. N. N. Fowler, at a cost of $13,000 complete. Two perspective elevations and floor plans. Mr. Guy Kirkham, architect, Springfield, Mass.

No. 3. Residence at Scranton, Pa., recently erected for Mr. Thomas R. Brooks. A unique design. Two perspective elevations and floor plans. Mr. John A. Duckworth, architect, Scranton, Pa.

No. 4. Elm Park Methodist Episcopal church and parsonage at Scranton, Pa. Two perspective elevations and floor plans, also two perspective elevations of the parsonage, with floor plans, Architects, Messrs. George W. Kramer & Co., New York City.

No. 5. English dwelling at Overbrook, Pa., recently erected for Mr. Smucker. An attractive design treated in the English style, half timber and stone. Perspective elevation and floor plans, also interior view. Architect, Mr. William L. Price, Philadelphia, Pa.

No. 6. Cottage at Binghamton, N. Y., recently erected for Mr. G. N. North, at a cost of $3,200. Two perspective elevations and floor plans. A design with many excellent features, good elevations and well arranged plans. Mr. Elfred Bartoo, architect, Binghamton, N. Y.

No. 7. Modern cottage at Nyack, N. Y., recently erected for the Rev. Edward Mitchell, at a cost of $2,500 complete. Two perspective elevations and floor plans. A unique design for small cottage. Mr. George F. Morse, architect, Nyack, N. Y.

No. 8. Modern suburban villa at Chestnut Hill, Mass., erected for Messrs. Merriam, Isbenbeck & Alvord. A design well treated in the modern American style with Colonial detail. Two perspective elevations and floor plans. Architect, Mr. J. H. Morse, Boston, Mass.

No. 9. A residence at Binghamton, N. Y., recently erected for Miss Q. M. French. Perspective elevation and floor plans. A very attractive design with excellent elevations.

No. 10. An actress' home at Chevy Chase, Md., illustrating the residence of Miss Annie Lewis. Two perspective elevations and floor plans. Mr. Louis D. Meline, architect, Chevy Chase, Md.

No. 11. Half page design of the New Rathsapotheke in Bremen.

No. 12. Pulpit of the Cathedral of Sainte Gudule, Brussels.

No. 13. Miscellaneous Contents: New York as a furniture market.—Advantages of fresh air in apartments.—Exterior plaster for dwellings.—Rules for making good mortar.—Premature occupation of new homes; a test for relative humidity of habitable apartments.—Ventilation of apartments.—Does your faucet leak?—A new recording thermometer, illustrated.—Beautiful work in wood finishing.—Slate roofs.—Dec-co-re-o, illustrated.—Berkfeld filter, illustrated.

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(7215) E. R. asks: 1. Could you inform me if the eight light dynamo described in SUPPLEMENT No. 600 can be used as motor? A. Yes. 2. How many volts shall I use? A. 50. 3. Have you published any paper in which you describe any motor of say 1 or 2 horse power? All your description I have followed, and I have a fine Holtz machine, a dynamo, an induction coil and a small motor. A. The Edison dynamo described in SUPPLEMENT No. 844 could be enlarged to meet your wants, and the SCIENTIFIC AMERICAN dynamo described in SUPPLEMENT No. 865 could be reduced.

(7216) E. A. B. writes: 1. I am about to build the dynamo described in SUPPLEMENT No. 600 with half dimensions. What number wire should be used on the armature, and how much for drum winding? A. No. 24. Use 16 coils, 24 turns in each coil, in 2 layers of 12 turns each. 2. How many wires should be placed in multiple on the fields, and what number should they be? What would be the amount of wire on the fields? A. Put 2 coils on each leg of field magnets, each coil having 250 turns of No. 22. 3. What would be the voltage and current of this dynamo? A. 50 volts and ½ ampere at 2,500 revolutions per minute.

NEW BOOKS, ETC.

THE PSYCHOLOGY OF THE EMOTIONS. By Th. Ribot, professor at the College of France, editor of the "Revue Philosophique." London: Walter Scott, Limited, Paternoster Square. New York: Charles Scribner's Sons, 153-157 Fifth Avenue. 1897. Pp. 455. Price $1.25.

This work sets forth the present situation of the psychology of feeling and emotion. It has been the aim of the author to keep the work within reasonable limits, and to this end he has refrained from digression and all historical exposition. The first part of the book is occupied with studies of the more general manifestations of feeling: pleasure and pain, and then the nature of emotion. The second part is devoted to the special emotions. The doctrine which the author adopts without restriction connects all states of feeling with biological conditions, and considers them as the direct and immediate expression of the vegetative life. Feelings and emotions are not a superficial manifestation; they have their root in the needs and instincts. The index (invaluable in a comprehensive work of this kind) is fairly voluminous.

THE NEW PSYCHOLOGY. By E. W. Scripture, Ph.D. (Leipzig), director of the Yale Psychological Laboratory. With 174 illustrations. London: Walter Scott, Limited, Paternoster Square. New York: Charles Scribner's Sons, 153-157 Fifth Avenue. Pp. 500. Price $1.25.

One of the great charms of the works of the late Professor Huxley was the simplicity and clearness of his style—his happy faculty of putting a scientific fact before his readers in simple terms that brought it readily within the comprehension of the reader. In the work before us the author manifests the same directness and simplicity of style and direction. The very term psychology is apt to carry with it ideas of abstruse metaphysical reasoning which deter any but the habitual student of the science from opening a new work on this subject. The present volume, however, will prove to be interesting and readily intelligible reading, even to those who have had little previous acquaintance with psychology. The new psychology consists in the application of physiological tests to psychological phenomena. Thus there is a measurable period of time between the moment that any object is presented to any of our senses and the moment of sensation. The new psychology, by means of delicate mechanical or chemical apparatus, enables us to measure this interval, which varies greatly in different individuals. So does the "time of reaction," or the conscious action in response to a signal. Part I of the volume deals with "methods," the next three are devoted to time, energy, and space, and Part V is a review of the past and present of the science. The work is freely illustrated with diagrams and half tone engravings of the various apparatus used by the author in the Yale laboratory, much of which is of his own design.

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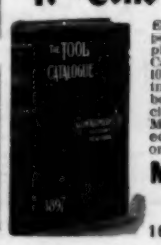
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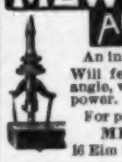
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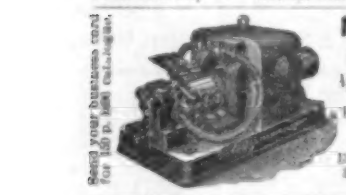

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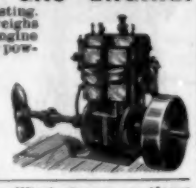

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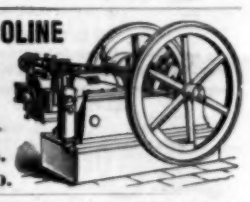

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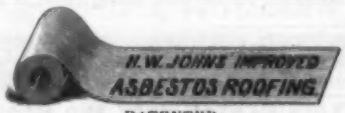

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